U. T. FARMER

Laying the First Brick in the New Agricultural Building.

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Teachers Studying a Beef Breed.

THE U. T. FARMER

Vol. 2. OCTOBER, 1907 No. 1

PROGRESS OF AGRICULTURAL EDUCATION IN TENNESSEE.

IN no state of the Union has there been such an educational awakening as Tennessee has experienced during the past five years, and every friend of the University is proud of the lead taken in the movement. President Ayres, Professor Claxton and other members of the faculty have been heard in every county of the state, and as a result of the interest aroused, the last legislature gave hundreds of thousands of dollars in excess of any previous allowance for the public schools; county high schools have been established, and a substantial appropriation has been made for the University.

In no phase of educational propaganda has there been more marked interest than in agricultural instruction. The newly appointed Commissioner of Agriculture, Hon. John Thompson, is an enthusiast in his advocacy of the teaching of agriculture in the public schools. At every farmers' institute held during the year Mr. Thompson has made this the subject of his principal address, and everywhere the people have given emphatic endorsement of his views by strong resolutions.

At the West Tennessee Farmers' Institute the State Superintendent of Public Instruction, Professor R. L. Jones, proved himself a champion of the cause of agricultural education; he not only spoke strongly in its favor, but at a meeting of county superintendents, who were present at the institute by special invitation, Mr. Jones asked each superintendent to join him in finding means for sending at least five teachers to the second short course for teachers of agriculture, to be held at the University next summer.

The great success of the summer session for teachers in agriculture indicates a realization on the part of the teachers of the state of the importance of this movement. Seventy-five Tennessee teachers availed themselves of the opportunity to learn practical methods of teaching the elements of agriculture. Not only did they take the three hours a day required in the course, but almost all of them devoted their entire time to agriculture and related subjects, and never has the University had a more enthusiastic group of students.

All these things indicate a growing interest in agricultural education, and it is a safe prediction that ten years will find as large a number of students in the agricultural course of the University, as in any course offered by the institution. The farmers generally do not realize what an impetus to increased production and greater profits is promised by the more thorough training of the boys and girls, but everywhere leaders of economic thought have come to this view, and no movement of recent years is so full of promise.

In the course of his address on the teaching of agriculture in the public schools, Commissioner Thompson gives the reason why the colleges of the country have so few students of agriculture, and why boys leave the farm. He says that both at home and in school, from his earliest years, the farm boy has been given ideals that lead from the farm; the successful men that are pointed out to him as worthy examples for him to model his life by are lawyers, doctors, merchants, manufacturers, engineers—never farmers! The reading books, the arithmetics—all the text-books indeed—have presented to the youth of the land phases of urban life, and have, until very recently, left the great world of nature and of rural affairs as entirely alone as though they did not exist. It is

Score Card Practice with Jerseys.

not strange, in the face of these influences coming into the lives of farm boys at the most impressionable age, that the effect is to belittle the advantages of farm life, and exaggerate the opportunities of cities. Mr. Thompson would have the rural school a preparation for farm life; and his administration will be notable if, as now seems probable, the country school does for the farmer's son what the city school does for the dwellers of the towns. Every one realizes that increased attendance at the agricultural colleges of the land rests on the development of the rural school, and particularly in the teaching of the elements of agriculture. Just as the city high schools throughout the country are the most important feeders of the literary and engineering courses in higher institutions of learning, the time is fast coming when the rural schools will send their pupils to

the agricultural courses of the land-grant colleges for advanced work in agriculture.

The University of Tennessee gladly joins the Commissioner of Agriculture and the State Superintendent of Public Instruction in their laudable efforts for the betterment of rural schools.

SOME RESULTS IN AGRONOMY.

Soja Beans—Liming Clay Loams.

THE work of the department of agronomy during the season now closing has been more varied than ever before. In addition to continuous experiments, which require a series of years for their full accomplishment, the plot work of the year has been full of interest and presents suggestions of value to the farmer.

Much has been done with the soja bean, and from present indications this plant will prove one of the most valuable forage crops that can be grown in Tennessee. Variety tests, cultural methods and comparisons with cow peas have been the most important investigations in connection with the crop; the indications are that soja beans can be sown earlier than cow peas—they can be planted any time from May 1 to August 1, and for best results should be drilled in rows from eighteen to thirty inches apart, so as to be cultivated. Of the thirty varieties tested the best early is Ito San, the best mid-season is the Medium Yellow, and the best late sort is the Mammoth Yellow. The latter variety is quite well known over the state, but the other two have not yet been offered by seedsmen.

Another interesting line of investigation is the effect of lime upon clay and clay loam soils. As the result of a series of plot experiments, the following garden and field crops were found to be much benefited by liming: Beets, cantaloupes, tomatoes, alsike clover, orchard grass, alfalfa, hairy vetch, cowpeas. Among the crops which apparently derived no benefit from the addition of lime were corn, cotton, rape, pole and lima beans and watermelons. One ton of air slacked lime was applied per acre.

THE CO-OPERATIVE EXPERIMENTS IN MIDDLE TENNESSEE.

THE last legislature provided funds for co-operative experiments in Middle Tennessee, and for a sub-station in the Western division of the state. The sub-station has not yet been located, but a beginning has been made in the work of co-operation. Professor Mooers has general charge of the work, and is assisted by Mr. J. E. Hite, who graduated in agriculture in the class of '05; Mr. J. E. Converse, formerly assistant in plot work at the station, and Mr. W. N. Rudd, a successful farmer of McMinnville, who has lectured before the University Short Course in agriculture. Experiments are being made on twenty-seven different farms, in fourteen counties, the localities being chosen as

fairly representative of conditions throughout the middle section of the state. In the Clarksville region extensive experiments with tobacco are under way; fertilizers for the crop, a proper rotation, and cover crops to follow tobacco are the principal lines of investigation. In other sections varieties, fertilizers, the effect of lime, and various cultural methods are the subjects of investigation.

In the nature of things, the work of this introductory year can at best be regarded as tentative, but Professor Mooers and his assistants are to be congratulated on the successful inauguration of the work, and the Middle Tennessee farmers will watch its progress with interest.

Learning to Bud.

SUMMER WORK IN ENTOMOLOGY.

THE attention of the assistant entomologist has been chiefly directed the past summer to life history studies of the southern cattle tick and the peach tree borer. For more than a year these two important enemies of the southern agricultural interests have constituted the major lines of investigation of the entomological department of this station and several interesting points in the life cycle of each have been brought out. These will be fully treated in future bulletins of this station.

During the early part of this summer two wire cloth cages were constructed in which to study insect behavior. One is located on the Uni-

versity campus and the other in the peach orchard at the fruit farm. These cages consist of a skeleton frame work over which is stretched finely woven wire cloth and constitute the latest type of insectories. In these cages the food plants of the insect studied, whether fruit trees or farm crops, are grown and the insects allowed to work upon them under natural conditions and yet be under the control of the investigator. Although the results obtained here must be checked with results secured in the field they indicate what to look for and where to look for it and hence are practically indispensable in economic entomology.

The cage on the University campus is used as a general insectory, while the one at the fruit farm, which encloses two good sized peach trees, is devoted exclusively to peach borer investigations. For the field observations on this insect a peach orchard located near Tazewell was secured. This has been visited several times this summer and many interesting points noted. In addition the peach orchard on the fruit farm and others near by have been under observation. The problem of preventative treatment for this pest has also received some attention.

A considerable outbreak of the army worm demanded attention during the early part of the summer. This pest seriously damaged meadows, pastures and wheat fields at several widely scattered points in the state. We received reports of injury from two counties in West, four in Middle and eight in East Tennessee.

While this insect is very common, a few worms appearing every year, it is only occasionally that the weather conditions are such as to permit them to do serious injury to grass lands or wheat fields. The pest passes the winter in the immature larval stage, hence they are ready to begin feeding the first warm days in spring. If the season is cold and backward, as was the case this spring, the worms feed unchecked by natural enemies, as the cool weather is unfavorable for the multiplication of the parasites which nominally hold them in check.

Other minor insect problems were taken up from time to time as their ravages brought them to our attention, but those enumerated above occupied the greater part of our time as they are considered the most important entomological problems before the agriculture of Tennessee of today.

E. C. COTTON, Asst. Entomologist.

SEASONABLE WORK IN HORTICULTURE.

Peach Tree Borer.

THE latter part of October and the month of November is the best time for cutting out the borers from peach trees. In September many of the larvae are so small that they are apt to be overlooked, but all are full grown late in the season. By far the greater number will be found just beneath the bark at the collar (where root and stem join) but a few will be found several inches below the surface of the soil, while

one will occasionally work as high as the main forks of the crown. Nothing has yet been discovered that is as effective as "grubbing" the trees. The best tool for the work is an old file, the handle end turned at the tip, and sharpened, for opening the channel made by the insect; the file end is also sharpened, chisel fashion, to remove the soil about the collar of the tree. A stiff wire is sometimes used for probing the channel, and in this way much cutting is avoided; but where proper care is exercised little injury results from opening the runs, and this method is the most thorough. It is absolutely necessary to remove the peach borers at least once a year, and this work is very apt to be neglected, to the permanent injury of the orchard.

Plant Fruit Trees.

The late autumn is an excellent time for planting all kinds of woody plants; it is the best time for replacing the dead trees in the orchard, but this is a matter for careful consideration, for if the apple trees have been killed by the wooly aphis (the most serious of our apple pests), one may be sure the soil is so infested with the little insects as to make it impossible for a young tree to get established. Indeed, this insect has become so very destructive throughout the southern range of apple culture as to make the planting of apple orchards on a commercial scale in Tennessee a matter of doubtful expediency. Recent investigations indicate the Northern Spy apple immune from this insect, just as the American grape is free from the attacks of the phylloxera, a European grape pest. If it should prove that Northern Spy, grown on its own roots, is a congenial stock for other varieties, the solution of the problem is assured. Whether the commercial growing of early apples ever reaches the great development in Tennessee that would seem possible or not, there can be no question but that every farmer should plant a small orchard, growing enough fruit to generously supply his own family. The important points to be considered in tree planting are: Choose strong, young trees, one year for all except cherry, give plenty of space so that the crown may reach full development with plenty of light; prune away all bruised roots, cutting from below upward; make the holes large, so as to give room for the natural spread of the roots; plant firm; then, if the tree is a single straight stem, cut it off from eighteen to twenty-four inches from the ground, and cultivate to any low growing crop, such as cotton, cow peas, or potatoes.

A Fruit List For Home Planting.

(Named in the order of ripening.)

Apple—Yellow Transparent or Early Harvest, Red June, Hoss, Maiden Blush, Grimes Golden, Jonathan, Rome Beauty, Kennard's Choice, Virginia Beauty, York Imperial, Ben Davis, Winesap, Yates.

Peach—Sneed, Greensboro, St. John, Carman, Mountain Rose, Family Favorite, Champion, Elberta, Salway, October, Lemon (cling).

Cherry—Montmorenci ordinaire, English Morello (sour), Governor Wood (sweet).

Pear—Keiffer.

Plum—Early Red, Bevay Green Gage, Abundance, Jefferson (gage), Wild Goose, Shropshire Damson.

Quince—Meeh's Prolific.

Grape—Moore's Early, Concord, Wilder (black), Elvira, Niagara, Goethe (white), Delaware, Lindley, Brighton (pink), Agawam (brown).

Blackberry—Early Harvest, Rathbun.

Raspberry—Ohio, Mammoth Chester (black), Cuthbert (red), Golden Queen (yellow), Columbian (purple).

Strawberry—Carrie, Klondyke, Parson's Beauty, Morgan, Gandy.

A market list would vary considerably from the above, and every one will have certain favorites which, of course, may be substituted, or added.

The Perennial Vegetables

Such as rhubarb, asparagus, horse radish, globe artichoke and the pot herbs, can be planted to advantage at this season, and nothing the garden produces so well repays the little labor their culture requires. In Tennessee the rhubarb succeeds best under heavy mulching, as the long summer is trying to the plant. Asparagus cannot be too heavily manured. It will pay to trench the land, filling the trenches liberally with manure and soil in equal quantities. The asparagus crowns should be covered five inches, so the bed can be plowed shallow every year. A light, warm soil with southern exposure, will bring the best results. Asparagus should not be cut till the third year after planting, and when well cared for the plants will produce indefinitely. Cutting may be continued until the first green peas are ready for use, and the bed should then be heavily manured and thoroughly cultivated. The Globe artichoke is seldom grown in Tennessee. The scales of the large flower buds are the edible portion. The plant is a gross feeder and requires heavy mulching with manure for best results.

PREPARATION OF LAND FOR ALFALFA.

IF the greater part of the money that has been spent in the purchase of alfalfa seed had been used in the preparation of the ground there would be more land in the State devoted to this important crop than now obtains. Alfalfa failures in Tennessee have been due more to the encroachment of crab and fox-tail grasses than anything else.

There are two ways of combating these pests. Fall sown alfalfa may receive light cultivation the following July and August. The implements used for the cultivation will depend upon the character of the land. The disc harrow is useful if judgment is used in adjusting it to conditions of soil and plants. The disc should be followed by a toothed harrow and all grass harrowed out. The mulch produced by the cultivation will be very beneficial to the alfalfa under ordinary seasons. In case of

extremely dry weather the stand of alfalfa may be injured by injudicious cultivation. If the alfalfa is in its second season cultivation should be started earlier, after the first and second cuttings. Early cultivation insures a better mulch for the dry, hot weather of midsummer and invariably is of very great benefit. After one season's successful cultivation it is easier to gauge the succeeding seasons' operations, for weeds and grasses have been reduced and the stand of alfalfa increased. In case the stand has been reduced by the grass, re-seeding should not be attempted until the early fall following the second season's cultivation; at this time the grass and weed growth has been subdued and the young plants will come on uninterrupted until they have made sufficient root growth to permit the whole field again being cultivated.

The second method of combating weeds in alfalfa is to get rid of them by the use of clean cultured crops before seeding to alfalfa. Soy or soja bean, using the Mammoth Yellow variety, is the most available and profitable crop for the purpose of cleaning land.

The following method of preparing land for alfalfa has proven very successful: Select an acre or two of well drained land, put on eight, ten or more loads of good stable manure and 300 pounds of acid phosphate per acre, (in lands known to be rich in phosphorus as in the Middle Tennessee basins omit the acid phosphate). Plow and subsoil, turning under the manure and phosphate, in the fall. Top dress in the spring with 2,000 pounds of burnt lime or 3,000 to 4,000 pounds of finely ground limestone rock. Sow the land with soy beans (Mammoth Yellow variety) in May, planting in 30 to 36 inch drills. The soy beans, from their erect and long continued growth, will permit of many cultivations for the eradication of grass and weeds. The beans may be removed in the fall for hay or grain, when the land should be again deeply and thoroughly plowed. Should winter weeds, such as chick weed, appear they should be destroyed by one or two cultivations before they go to seed. The following spring plant in soy beans again, and cultivate carefully and often as before. They pay for every cultivation given them. In August of the second year cut the soy beans for hay; then without plowing thoroughly disc the land two ways, harrow and prepare the best possible seed bed and sow in August, or very early in September, 30 pounds of pure alfalfa seed per acre. It is best to sow 15 pounds per acre two ways, thus securing more even scattering of the seed; cover with weeder or light harrow.

By this one method the weeds and grass seeds on the land and in the manure have germinated and been destroyed, and ideal preparation is given for alfalfa and at the same time paying crops of soy beans have been produced.

Alfalfa and crab grass will not associate with profit to the alfalfa or the grower, and the crab grass must be eliminated either by cultivation where a fair stand of alfalfa has already been procured, or by very thorough preparation of the land by clean culture crops, of which the Mammoth Yellow Soy bean is available and most acceptable.

THE NEW AGRICULTURAL BUILDING.

THURSDAY, the 19th of September, witnessed the laying of the first brick of the new agricultural building, made possible by the generosity of the last legislature. The brick was laid by Master Jack Morgan, and if all the doings of his life are accomplished with the same enthusiasm, the director of the station will always be as proud of his son as he is today. Quite a company assembled to witness the laying of the first brick, including the President of the University and Mrs. Ayres, Director and Mrs. Morgan, members of the agricultural faculty and agricultural students.

The new building will be one of the largest on the campus, and an ornament to the hill. Its location is about one hundred yards west of Barbara Blount Hall. It will consist of a sub-basement, basement, and three stories, the architecture being a pleasing form of modern romanesque. The full plan contemplates a central extension to the south, to be occupied by a stock judging pavilion, dairy laboratories and an assembly hall, but this can not be erected at present, owing to the limited appropriation available. The present structure will provide quarters for the following departments: The sub-basement will be occupied by the departments of animal husbandry and veterinary science, with temporary quarters for dairying, and cellars and store rooms. The basement will be devoted to agricultural chemistry, agronomy and horticulture. The offices of the director, the agricultural library and the department of zoology will occupy the first floor. Botany and bacteriology will be located on the second floor, where also will be a fine room for the agricultural club. The third floor will be occupied by the department of entomology and the museums. Each department is provided with ample laboratories, class rooms and offices. Due regard has been paid to the important matter of lighting, and the plan, as a whole, is a model of convenience. It was designed by Professor Charles E. Ferris, in consultation with the heads of departments interested.

At this writing brick laying is progressing rapidly and it is hoped the building will be ready for occupancy early in the new year.

THE NEW PROFESSORS.

THE University Faculty list contains twelve new names. Six of these stand opposite new positions in the University, and of the six three are additions to the working force in agriculture. F. C. Quereau, assistant professor of animal husbandry, is a native of Illinois. While a young boy his family removed to Louisiana, where his father is a breeder of red polled cattle. Professor Quereau graduated at the University of Louisiana, where he was a student under Director Morgan, and has completed a post graduate course in animal husbandry in the University of Illinois, making his thesis under Professor Mumford, one of

the most distinguished specialists in animal husbandry in America. Professor Quereau has taken hold of his work in Tennessee with great energy and enthusiasm, and the U. T. Farmer voices a hearty welcome to him on the part of the agricultural students.

Josiah Main, assistant professor of agricultural education, is a graduate in agriculture of the University of Illinois, and has had extensive experience in normal and public school work. Professor Main has taught agriculture in teachers' institutes and summer schools. He will devote much of his time to the work of University extension in agriculture, visiting the county high schools and lecturing before teachers' associations and institutes.

Mr. C. H. Lane, a graduate of the University of New Brunswick, assistant in agronomy, comes to the station from Washington College, where he was professor of chemistry and natural science. Mr. Lane will devote all his time to experiment work.

With the opening of the school year new departments of geology, in charge of Professor C. H. Gordon, Ph. D., and of mining engineering, in charge of Professor R. P. Jarvis, E. M., were established. Miss Gilchrist, who resigned as dean of women at the close of the last session, is succeeded by Miss Mary Louise Tuttle. Capt. A. H. Nave, commandant of cadets, resigned during the summer vacation, and is succeeded by Capt. Hugh B. Meyers, of the Sixth Cavalry, U. S. A. Mr. Richardson is succeeded by Mr. R. C. Matthews as assistant in drawing and machine design; Professor J. Thompson Brown, University of Virginia, is the successor of Professor Wolf, as assistant in English. Dr. Eckles, Johns Hopkins, substitutes as professor of Latin for Dr. Jordon, who is granted a year's leave of absence. Mr. Glen Worthington, of U. T. class of 1906, is instructor of physics, assisting President Ayres, who has taken charge of this department, Dr. Perkins being made professor of electrical engineering. Mr. L. W. Dwight succeeds Mr. Kirkman as foreman of the pattern shop.

Never in the University's history have there been so many new names added to the list of officers in a single year.

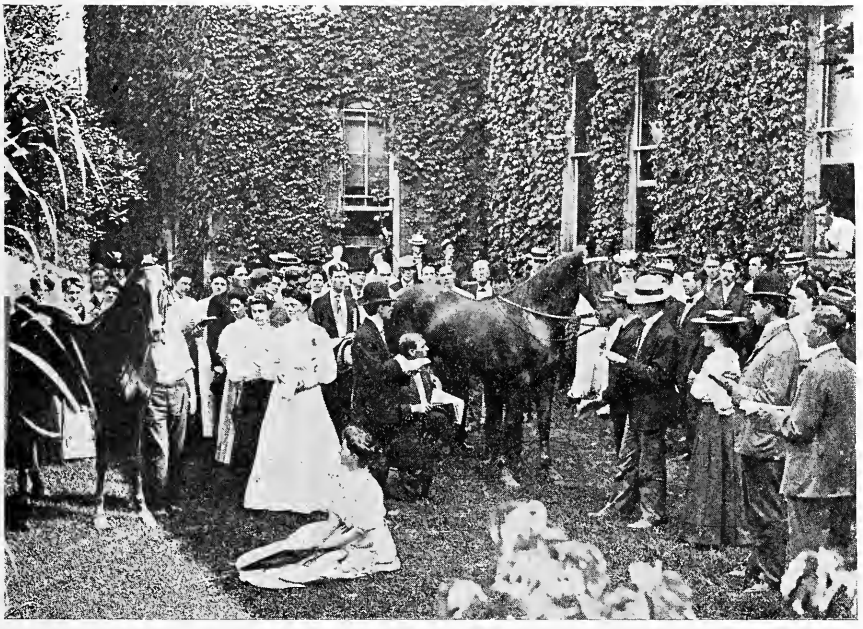
THE AGRICULTURAL ALUMNI.

YEAR by year the agricultural department of the University of Tennessee has been adding small numbers of men to its alumni until now they are distributed over the entire state and in many adjoining states. These men, for the most part, are successful farmers who have been greatly helped in their life work by the lessons learned at their alma mater. They do not wish to lose touch with the University and they rightly share in her undertakings and successes. With this thought in view, at the close of the past session, the Agricultural Club added to the U. T. Farmer an alumni department and placed in charge a member of this body. Thus the alumni may, through their representative,

have a voice on the board of editors. It is the purpose of this department to publish as fully as possible notes concerning former students. Whether this new feature shall be successful or not depends upon the co-operation of the alumni.

If each member of this body who sees a copy of the U. T. Farmer will send his name, address and occupation, and will do likewise in regard to other former agricultural students that he may know, this department will be a success. The editor-in-chief will also be glad to publish, in each issue, an article written by an alumnus.

Lastly the circulation manager wishes to place on his "paid up"



The Points of a Good Horse.

subscription list the name of every "Longhorn and Shorthorn who ever browsed around the old U. T. Hill." The price for the nine issues is only fifty cents (50c). It is worth more than that to you and costs more to have it published, so let us come up as a body with the money.

L. R. N.

Note—Alumni notes and articles written by any former agricultural students should be sent to L. R. Neel, Gap Mills, W. Va.

AGRICULTURE IN PUBLIC SCHOOLS.

AT the first meeting of the Organization for the Promotion of the Teaching of Agriculture in the Public Schools of Tennessee, the following resolutions were adopted:

Whereas, we, the representatives of the various counties of the state, recognize the value of the agricultural course as given by the University of Tennessee in connection with the Summer School of the South, and

Whereas, we have been made conscious of the special need of agricultural education throughout the state; be it

Resolved, First, That we hereby express our full confidence in this course as being particularly suited to meet the needs of teachers throughout the state.

Second, That we extend our appreciation to the authorities of the University for this their most vital effort to reach and serve the public schools of the state, and we trust that they may see their way clear to make this a permanent part of the University work.

Third, That we hereby pledge ourselves to do all we can to make the summer course permanent and to increase the number of scholarship students to five from each county.

Fourth, That we earnestly request the full sympathy and co-operation of all the county superintendents and other public school officials in this movement.

Fifth, That we carry this work home with us and spread it in our respective communities: first, by its immediate introduction into our schools, and, second, by an appeal for agricultural instruction in our institutes.

Sixth, That we recommend that attractive agricultural books be placed in our school libraries.

Seventh, That a course in Home Economics be given.

TEACHERS ORGANIZE.

ON July 18, 1907, the student-teachers in attendance on the Agricultural Course for Teachers, offered by the University of Tennessee in connection with the Summer School of the South, effected a permanent organization by the election of the following officers:

Chairman J. A. Roberts, of Hamilton County; Vice-Chairman Miss Eula P. Carroll, of Coffee County; Secretary-Treasurer J. W. Williams, of Carroll County; Assistant Secretary-Treasurer W. H. Winston, of Obion County. The above officers, with J. S. Zeigler, of Hamilton, Miss Kate Liggett, of Marshall, and Miss Mary Lou Gilliland, of White, were made an executive committee to whom was designated the general management of the organization.

The following by-laws were adopted:

Article I—The name of this organization shall be "An Organization for the Promotion of the Teaching of Agriculture in the Public Schools of Tennessee."

Article II—The meetings of this organization shall be held at the University of Tennessee during the fourth week of the Summer School or at any other time or place by call of the president.

Article III—Any person in Tennessee who is interested in scientific agriculture shall be eligible to membership.

Article IV—Section 1. The officers of the association shall consist of a chairman, a vice-chairman, a secretary and treasurer, and an assistant secretary and treasurer, who shall be elected annually. These officers, together with the chairman of the Department of Agriculture, who shall be ex-officio a member, and two members who shall be appointed by the chairman from different civil divisions of the state, shall constitute an executive committee.

Sec. 2. The duties of these officers shall be those usually delegated to the same officers in similar organizations.

EDITORIALS.

The present issue of the U. T. Farmer is largely devoted to the work of the Agricultural Department and of the Experiment Station during the summer. It fairly indicates the wide range of educational effort in agriculture, and the increasing prominence of the University of Tennessee in agricultural leadership in the state. The experiment work, while not strictly educational, has the same effect of agricultural betterment, and the added advantage of immediate usefulness to the farmer. It is fortunate that the University is keeping the experimental and the educational phases equally prominent, for both are urgent needs of Tennessee agriculture.

The Hon. John Thompson, Commissioner of Agriculture, was aided in conducting farmers' institutes in Middle and West Tennessee, by Professors Morgan, Bain, Keffer and Barnes. The institutes were successful in every instance, in some cases the attendance taxing the capacity of the halls, and everywhere the interest was marked. During the first week in September, Professor Morgan assisted Congressman Hull in a series of farmers' meetings in the Fourth district. The remaining speakers were prominent scientists of the U. S. Department of Agriculture, and it is gratifying to the U. T. Farmer that the press comments place our director at the head of the list.

Old students will hardly recognize South College in its new dress. Partitions have been removed, so that all the rooms extend from the east to the west side of the building; steam radiators have supplanted fire places; the walls and ceilings have been tastefully painted; and the entrance to the post office and book store has been placed in the south end. A new slate roof, with wide cornice, new windows throughout and new entrance porches quite transform the exterior, and a broad cement walk extends from Science Hall to the north door of South College. In the course of the improvements it was necessary to cut away all the ivy, but the roots are unharmed and a new growth will soon cover the painted walls. The unsightly porches of the other old buildings at the top of the hill have been removed, and tasteful entrances supplant them.

A large coal shed has been built adjoining the railroad spur, thus insuring the institution against fuel shortage, such as was threatened last year.

When the new Morrell Hall is completed the present building of that name will be remodeled for the departments of geology, metallurgy and mining engineering.

PERSONAL.

On account of poor health, Dr. Jordan has been granted a year's leave of absence from the University, and has been relieved of the duties of dean of the literary department. He is at present in Asheville, and his condition is much improved.

Professor Schmitt has been made dean and the boys will continue to use the more familiar "Cooper D" in speaking of their best loved professor, just as in years passed. He spent the summer, with his family, in Europe.

Dr. Jordan has the sympathy of the entire student body and the thousands of ex-students of the University in the death of his wife, which occurred during the summer vacation.

Professor Perkins, under the direction and with the active aid of Mrs. Perkins, built a stone retaining wall at his summer home in Connecticut during the vacation. That is one reason why he is looking so muscular this fall.

D. W. Duncan, of Tasso, and J. W. Williams, of McLemoreville, addressed the West Tennessee "Round Up" Institute at Jackson on the University Short Courses in Agriculture, the former discussing the Winter Course for farmers and the latter the Summer Course for teachers. The University is fortunate in having such able advocates.

Mr. W. C. Hix was operated on for appendicitis at St. Joseph's hospital, Nashville, the week of the University's opening, and will not return until after the holidays. His friends will be glad to know the operation was successful and he is rapidly recovering.

HOW THEY SPENT THEIR VACATION.

Herman Work, '09, was in charge of one of Prof. Bain's divisions of cotton breeding under the plant industry bureau. His location was around Cade Cove.

Worthington, '10, spent the summer in the Summer School of the South.

Thomas, '10, and Christman, '09, spent the summer at home.

Wilson, '10, and Henders, '09, worked in the dairy on the University Farm.

Shofner, '09, Hix, '09, and Landess, '10, worked more or less on their fathers' farms in Middle Tennessee.

Jarnigan, '10, spent the summer at home.

Murphy, '10, spent the summer at home.

Peery, '10, spent the summer at home.

Johnson, '09, camped with the militia at Overton Park, Memphis.

Anders, lone agricultural senior, is in West Tennessee assisting Professor Bain in his cotton breeding experiments.

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BOARD OF EDITORS

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Address all communications to

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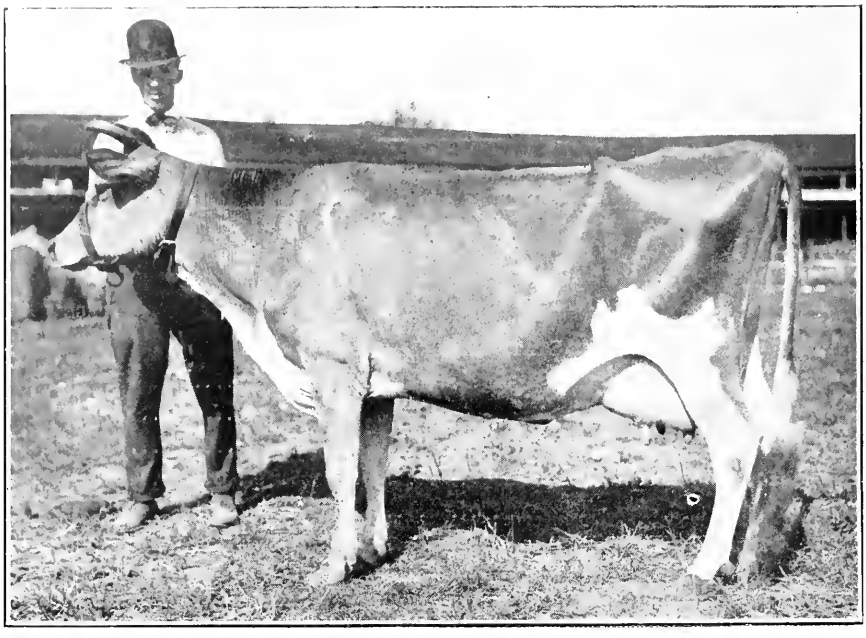
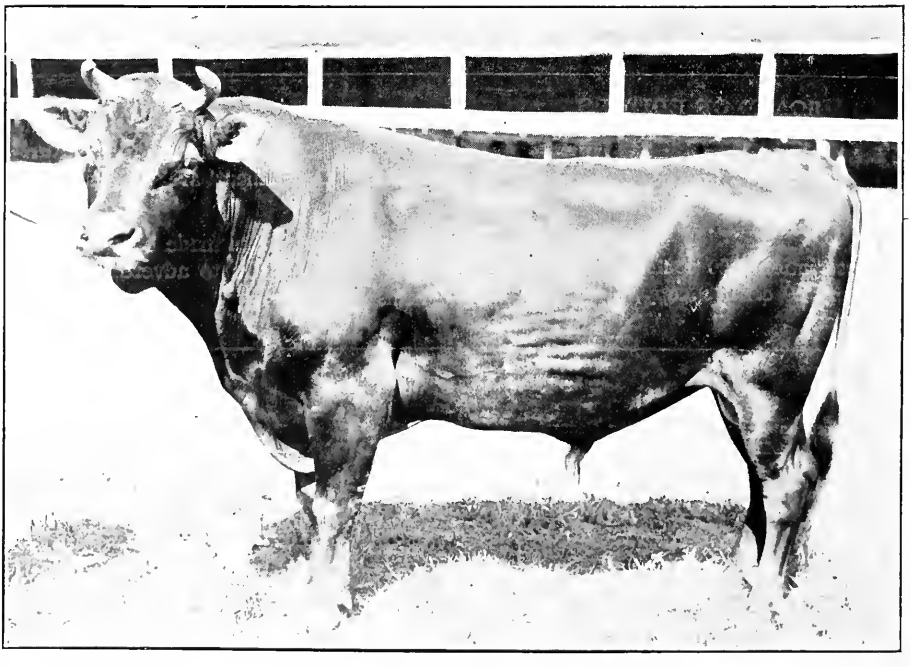


GOLDEN FERN'S SENSATION

Owned by A. B. Lewis, Virginia



BROOKHILL FOX

Owned by J. M. Overton, Overton Hall Farm, Nashville

THE U. T. FARMER

Vol. 2. NOVEMBER, 1907 No. 2

THE TENNESSEE STATE FAIR—A SYMPOSIUM

Dairy Cattle.

THE exhibit of dairy cattle at the State Fair at Nashville was much larger than last year, and included many high class animals. There were four of the leading dairy breeds represented, namely: Jersey, Guernsey, Holstein, and Brown Swiss. The Jerseys were most numerous, being represented by seven high class herds. The other breeds, though represented by small numbers, had some high class animals in the ring.

Since Tennessee is almost entirely a "Jersey" state, it will probably be interesting to note some of the leading characteristics of the different breeds. Although all dairy cattle conform more or less closely to what is known as the dairy type, yet each has its own peculiar characteristics that distinguish it from all others.

The Guernsey breed has been developed on the island of Guernsey, sister to the island of Jersey, the home of the Jerseys. They are somewhat similar to the Jerseys in color, conformation, milk yield, etc. The two breeds originated from the same parent stock.

The Guernseys are fawn colored, but of a redder shade than most Jerseys, with more or less white. They are a little larger than Jerseys, and their conformation is very loose and somewhat coarse in some individuals, and they carry a little more flesh throughout than the Jerseys. They are characterized by a very prominent shoulder, having the appearance of being loosely attached to the body. In yield and richness of the milk they are practically the same as the Jerseys, but their milk has a more marked yellow color than that of any other breed. This makes them very desirable for the production of market milk.

This breed was represented by one herd belonging to Hupp Farm, in Michigan. The herd included some excellent individuals.

The Holsteins are a black and white breed that was developed in the Netherlands by careful, intelligent breeding. They are a much larger type than either the Jerseys or Guernseys, and in some individuals, are somewhat rough, owing to size of bone. While some individuals are of that extreme spareness-of-flesh type, as a breed they carry more flesh, especially in withers, back and thigh, than do the Jerseys.

In the quantity of milk produced they are surpassed by no other breed, but their milk tests low in butter fat. This breed, however, is fast coming to the front as a butter producing breed.

The Brown Swiss breed is very litle known in Tennessee, but is being bred quite largely in some of the Northern States. Although they are often classed as a dual-purpose breed, and are rather beefy in conformation, the Brown Swiss breeders are classing them as a distinct dairy breed, and are breeding more toward that type at present. The Brown Swiss breed originated in the mountains of Switzerland. They are one of the largest, if not the largest, of the dairy breeds. They are at present quite fleshy in conformation, but are being bred away from this type. The one herd at the State Fair included one aged cow that conformed very closely to the extreme dairy type, being distinctly wedge-shaped, and as spare of flesh as one could ask of a cow of any breed. The color varies through different shades of brown and dun. They are a strong, vigorous breed, and the young animals have a thick-fleshed, robust appearance that is very pleasing to the eye. They rank well as milk and butter producers.

To describe the Jersey breed to a Tennessee reader would be like trying to tell him how some member of his own family looks. Tennessee ranks among the first states in the production of pure bred Jerseys of the highest quality. Tennessee Jerseys have a great reputation not only for beauty, but especially performance at the pail and churn.

One would naturally expect that, in such a Jersey stronghold as Middle Tennessee, there would be a larger exhibit of Jerseys than of any other breed. But to say that the great array of Jersey aristocrats present at Nashville surpassed the greatest expectations of the Jersey enthusiasts does not give a true conception to the greatness of this show. It was, without doubt, the greatest Jersey show ever held in the South, and there have been few better in America.

The breed was represented by 130 individuals from seven different herds. Of these seven herds four were from Tennessee, the exhibitors being: Overton Hall Farm, J. M. Overton, Proprietor; Gleneliff Farm D. S. Williams, Proprietor; Lynnwood Farm, Mr. M. M. Gardner, Proprietor; Longfield Farm, Messrs. Jas. L. Cooper & Son, Proprietors. All these breeders are located within a few miles of Nashville.

The three herds from outside the state were owned by Lewisiana Farm, Fredericksburg, Va., Mr. A. B. Lewis, Proprietor; Dreamwold Farm, Situate, Mass., Mr. Thos. W. Lawson, Proprietor; and Mr. A. Garth, of Trenton, Ky. That such herds as these are attracted to Nashville speaks well for the reputation of the Tennessee Fair.

The greatest interest centered around the aged bull class when Imp. Brookhill Fox and Imp. Stockwell met for the first time in the show ring. These two magnificent bulls had the spectators guessing as to which one would win first place, and although all Tennesseans were more than pleased when Mr. Dempsey tied the blue ribbon on Brookhill Fox yet they could not but recognize the style and quality of Stockwell. He is a bull that will always stand in the best company.

In the aged cow class the Lewisiana herd came in for first place with Golden Fern's Sensation. Sensation is a great cow, being almost perfect in type and showing a great deal of power.

To mention all the good ones among the Jerseys would require too much time and space. Among the young animals were several that are fast winning fame in the ring, and not a few of them belong in Tennessee.

These exhibits of dairy cattle furnish to the farmers of the state an excellent opportunity to become acquainted with the best type of the various breeds. It is an opportunity of which more should take advantage.

Dairying.

The problem of getting dairying before the people in a way that will illustrate the vast possibilities of this industry in the State of Tennessee is one that has been given much consideration by the Experiment Station workers in this branch of agriculture. A few months ago the promoters of the State Fair suggested that the University of Tennessee conduct a "working dairy" during the Fair week in which students of the Agricultural Department would separate milk, make butter, and operate an up-to-date milking machine. This plan, having a promise of much good, was adopted.

The Fair Association equipped a dairy and installed a milking machine for the purpose above mentioned, and the professors of the Agricultural Department of the University with three students and ex-students, put things into operation.

The fresh milk was taken direct from the cow and separated with up-to-date machines of standard make. This process illustrated the advantage of removing the cream from the milk as soon as it comes from the cow. The bulk is reduced, the cream can be more satisfactorily ripened, and the skimmilk is left sweet and warm for feeding. Many people assembled, and short talks were made by the operators, explaining the process and its advantages.

The cream was ripened and churned there in the dairy where everyone could see the process. The advantages of scientific butter making were made apparent to hundreds of people, many of whom had for years considered themselves good butter makers. They marveled at the ease and simplicity of it all when carried on in this up-to-date way. The influence of temperature, of the proper ripening of the cream, and of the proper working of the butter, upon the quality of the finished product was explained to a large number of persons. This was an eye-opener to many old butter makers, who declared that they would not take anything for what it had taught them.

Milk testing was also a feature of the work, in which considerable interest was aroused. Milk was tested, to show the ease with which one can keep in touch with the "workings" of the cows. The importance of keeping records of the herd was emphasized and discussed, and many dairymen were surprised when they learned how easy it is for them to lose hundreds of dollars by not knowing what each cow is producing.

The exhibition and operation of the labor-saving milking machine created more interest than was anticipated, and the crowd could not be accommodated. Of course, a great deal of idle curiosity was manifested, but much real interest was evident among the dairymen, who had cows to milk and were looking for the best and the easiest way to do it.

There were three classes for exhibited butter. Prizes were offered for the best single pound of butter, the best ten-pound package of butter in bulk, and the best pound of butter made on the Fair grounds by any lady of Tennessee. This butter was all of decidedly better quality than that exhibited last year, the scores ranging from 81 per cent to 93.5 per cent, on a basis of 100 per cent as perfect. It is very gratifying to the members of the agricultural staff of the University to know that all ex-students of the agricultural short course who exhibited butter at the Fair got into the prize list.

There was much discussion of dairy problems at the Fair during the entire week, and it is believed that much good was done. The people generally expressed themselves as being pleased, and said they had learned a great many things about dairying.

The working dairy at fairs can be made very instructive, provided the people will give the Station an opportunity to help them. Everyone will agree that there is nothing like "showing" people.

Beef Cattle.

The writer had given little thought to the Tennessee State Fair until he accidentally heard the Secretary and General Manager J. W. Russwurm make the statement, "Yes, indeed, we are going to have a fair in Nashville this year that will make the 'wise ones' all over the country sit up and take notice. We are going to have the live stock."

Live stock they did have! Probably never before in the history of Tennessee has there been such a magnificent exhibition of pedigreed cattle, horses, mules, sheep, goats, and swine as could be found in the Live Stock Pavilion and adjacent buildings at the Tennessee State Fair, which opened its gates in the second year of its existence Sept. 23, 1907.

Not only did the animals represent a high standard of excellence, but they were exhibited to the best possible advantage. The old covered race track of the Cumberland Racing Association had been converted into a live stock pavilion. Had it been constructed expressly for the purpose the arrangement could not have been better. This pavilion is three-eighths of a mile in circumference, oval in shape, and open to the infield all the way around. The cattle stalls are eight feet wide, each accommodating two head. Behind the cattle as they stand in their stalls there is ample room to drive a wagon loaded with hay and at the same time permit the spectators to pass without very much inconvenience.

Just inside this covered track, or pavilion, were constructed covered and floored pens for sheep, swine, and goats. The horses and mules were

stabled outside of the pavilion proper. Each stall and pen was filled—three-eighths of a mile of show—without doubt the finest array ever shown in the South.

One of the first things to catch the eye as the pavilion is entered is the broad, heavy tops of the Reds and Roans. The Shorthorns made a good showing. All of the animals that were on exhibition were strictly up to the standard. It was evident even to the most casual observer that there were no mere pedigree bearers with little else to recommend them in the Shorthorn section. The herd of Carpenter & Ross the only out-of-the-state herd entered, carried off first honors in every class entered; but the victory of the visitors was not easily won, for in each instance the Tennessee-bred herd of A. R. Alley, of Bellbuckle, was a close second. The other exhibitors were R. C. Frey, O. H. Davidson, and T. M. Stevenson, all of Tennessee.

The herd of Alley was the best of the Tennessee-bred Shorthorns, showing a high standard of finish and quality. He will be heard from again next year. Unless the writer is a bad prophet and a poor judge of beef cattle—with special reference to Frey's Scotch Robin, Davidson's Cloverdale Victor 6th, and Alley's Baron Sunbeam 7th and General Royal—all young things—there will be a greater number of Tennessee Shorthorns wearing the blue next year than there was this year. If the limestone soil of Tennessee can produce the bone quality and finish in the horse and mule—as in times gone by it has been so abundantly proven that it can do—is there any good reason why it will not produce cattle of equal merit? The writer thinks not, and believes that he will soon be "shown."

The Hereford may not have created the excitement in the world of breeding that some of the other breeds have done, but it is a fact worthy of note that his white face and uniform color markings are always very much in evidence when there any fat cattle to be shown, and the records foot up a goodly percentage of grand championships to his credit.

The stalls of the Hereford section at the State Fair were well filled, this breed making the best showing of all the beef breeds. Messrs. W. S. Vannatta & Son of Fowler, Ind., exhibited a very fine herd of show Herefords, winning first in every class entered. Giltner Bros., of Eminence, Ky., made a good showing in young stock. The number of animals shown by them was not large, but all of the individuals were up to standard. Of the Tennessee herds, that of J. O. Kittel will probably stand first. First place was won by him in the aged bull class on Woodford Boy. The other exhibitors were D. A. Edwards, Gilspie & Pain, and J. C. Leigh, of Tennessee.

The Aberdeen-Angus breed made an excellent showing, but it is worthy of note that all of the premiums were divided among three foreign herds that were exhibited, although the Tennessee-bred herd of the Burkitt Farm made a good showing. The reason the Tennessee herd did not win more premiums is probably the fact that they were competing against

three of the oldest and best-bred herds in America. Next year the Burkitt Farm will be heard from again, and if indications go for anything will return home with a larger number of premiums to their credit.

It does not seem that this breed has been given the consideration by the breeders of this State that its high standing among the breeds would warrant. The Angus "doddie" has much to recommend him to the Tennessee farmer. Nature has kindly reduced his armament, thus precluding the necessity of dehorning in order to facilitate feeding and housing. The Angus matures early, although not quite so early as the Shorthorn or Hereford. This defect, however, is more than counterbalanced by a hardy constitution and rustling proclivities, for which the breed is so justly famous, and that would render it peculiarly adapted to many sections of this State. This breed is also noted for the production of feeders and baby beef, a feature that should appeal to the breeders of Middle Tennessee who make this line of work a major portion of their business in cattle raising. The Angus is deeply and uniformly fleshed, does not easily become overripe in finishing, and dresses out a high percentage of the best quality beef, which will practically insure the shipper a higher price on a discriminating market than he could get for any other breed of cattle unless it be the Galloway.

The Angus exhibitors at the State Fair were Messrs. B. B. Johnson & Son, of Atlanta, Ind., who won first in every class entered except that of the two-year-olds, which was won by H. M. Brown, of Ohio; Johnson getting second place. The other exhibitors were Dr. E. E. Gwin, of Illinois, and the Burkitt Farm of Tennessee.

It is much to be hoped that the splendid exhibit of the Angus "doddie" at the State Fair this year will do much toward creating a greater interest among Tennessee breeders toward Aberdeen-Angus cattle and that the time is not far distant when the polled head and cylindrical body of the doughty Scot will be as much in evidence at our county fairs as his red and roan countryman, or his white-faced cousin form Herefordshire.

Hogs.

Corn at sixty cents a bushel will put the farmers to thinking. Many of them know that an animal having good blood will consume a bushel of corn with more profit than the scrub; with this in mind the farmer hunted the hog pens at the State Fair looking for a boar or gilt that would start him right in the hog business. Nor were they disappointed when they went hunting for good ones. The exhibit was clearly characterized by its quality while many classes had more than a dozen entries.

Mr. DeBow won every first in Berkshires except sow pig, which, with the second money went to the entries of W. D. Mooney. Hupp Farm, Birmingham, Mich., took second place in all classes but aged boar, which went to Clover Bottom Farm, and sow six moths old and under twelve to J. F. Tucker & Son. Mr. Geo. W. Jessup, of Missouri, made the awards.

Mr. Jessup found no competition in Chester Whites and gave all premiums to W. T. Dever of Lucasville, Ohio.

The Poland China breeders brought out a good lot of well fitted individuals. No breeder had the easy going road here. Some of the closest and hardest fights of any of the breeds were contested among the Polands. Several types were shown in the boar classes but the judge—J. M. Klever of Ohio, adhered closely to the medium hog, smoothly fleshed, nicely finished, standing on short, well set legs and strong feet. There is a tendency now toward a larger animal for the showyard, and not the smaller and altogether complete hog that did the winning a few years ago.

The following breeders contributed Poland Chinas: A. C. Grieve & Son of Ohio, Clayton & Rice of Ky., S. J. Burk of Mo., and O. P. Barry, E. S. Wright, Smith Bros., and Joe Dodson of Tenn. Every first prize in open class went out of the State, with Clayton & Rice getting champion boar, champion sow and aged herd. Grieve & Son took first on young herd.

The Duroc Jerseys represented the herds of Mahon Bros., Osborn, O., Conger Bros., Fayetteville, Tenn., and W. T. White, Milton, Tenn. Mahon Bros. had the larger end of the show in the open class and Conger Bros. had the better of it in the Tennessee classes. Mr. Klever was the judge.

Sheep.

The sheep exhibit attracted a large crowd, due no doubt to the place this kind of live stock is taking in the State's agriculture. The show was truly a great one. Its influence upon the sheep husbandry of the State will be felt.

The adaptability of the Southdown in Tennessee makes them better known. Exhibitors of this breed were T. M. Hinkle & Son, Springfield, Tenn., Walter Palmer, Edgfield Gap, Tenn., and Geo. McKerrow, Pewaukee, Wis.

The money was well divided in the open classes and in Tennessee class Messrs. Hinkle & Son took everything. Dr. H. P. Miller, Sunbury, Ohio, made all of the awards. Messrs. McKerrow & Harding brought out individuals that stand for the very best type in Shropshire breeding. This was one of the best exhibits ever passed upon by a judge in this country.

Oxfords were exhibited by Geo. McKerrow, Hampshires by Messrs. Palmer and F. W. Harding, Waukesha, Wis; Cotswolds by Harding; Lincolns by H. M. Brown of Ohio; Dorsets by John R. Nash of Indiana; Merinos by W. Cook & Son of Ohio; and Rambouillets, by J. K. Scott of Tenn. These breeds, while not often met with in this state, have special qualities that commend them to certain conditions and localities.

The Poultry Show.

A State Fair is not complete without poultry and yet fairs are usually held too early for the best birds. It is hard to get the young stock well matured and the old birds in full enough feather to make a good show, but

these obstacles did not keep the poultry show at the fair from being one of the best this season. The increasing interest was shown by the number of entries doubling that of last year.

The fanciers were given a large room in the new building and Mr. Murkin, the superintendent, had everything in good order. All were classified and in their proper places by Tuesday morning with an ample share of room. The judging began promptly and was carried straight through, the ribbons going on the same day. The ever present crowds of admirers indicated that this was one of the principal features of the fair.

Considering the time of year the quality was excellent and the quantity was not lacking. In the more popular classes large numbers were entered and competition was close. In the Barred Rocks, Joseph Winkler, of Illinois, and J. T. Davis, of Lewisburg, Tenn., were closest rivals. The hen and cockerel winning first prizes, owned by Mr. Winkler, attracted much attention because of their beautiful shape and color. The best exhibit of White Rocks was owned by H. E. Mattox, of Oakland, Ill. Mr. Winkler and H. E. Mattox have since proven the quality of their birds by exhibiting at the Jamestown poultry show—Mr. Winkler winning second hen and Mr. Mattox first cockerel. In the remaining breeds the winners of the principal prizes, we are proud to say, were from our own state. In the lists of winners we see the familiar names of Frank H. Rion, E. L. Doak, breeders of the White Wyandottes, H. B. Lansden and Frank Langford, breeders of Single Comb Rhode Island Reds, and R. S. Hopkins, the White Leghorn breeder.

As with other live stock, the poultry show acts as an educational feature in teaching and establishing uniform thoroughbred breeds and in stimulating the breeding of higher class stock. At this show the largest class of farmers can be reached, and the show, acting as an incentive, will cause many to discard the barnyard mongrels and replace them with more profitable pure bred stock. We hope the increasing interest in this show will continue, causing it to become one of the greater departments of the fair.

The Agricultural Exhibit.

What should be the principal purpose of agricultural exhibits at a state fair? In the writer's opinion the officers of the Tennessee State Fair are taking the proper position in regard to this question by encouraging as far as possible the educational feature. To make the Fair a place chiefly for the exhibition of mammoth pumpkins, extraordinary ears and stalks of corn, enormous sweet potatoes, etc., could hardly be expected to meet the continued approval of the people. On the other hand, the Fair may undoubtedly be made very valuable to the farmers of the State as well as attractive to citizens and visitors from other states, by what may be termed educational displays of corn, small grains, forage plants, etc., throughout the great range of crops grown in the State.

To get the best results, the exhibitor should pay special attention to some one crop. Let us take corn as an example. It may be exhibited both in ten-ear lots and on the stalk. In the former case much judgment and ability may be shown in the selection of uniform and model ears. Only too often the exhibits of both this year and last showed little knowledge on the part of the exhibitors of the simplest requirements, such as uniformity in color of cob, length and size of ear, and similarity of grain. Only those who have the ability to select corn with regard to these and other scorecard points can hope to breed corn of pure and uniform character. The exhibition of model lots is an educational feature, and one that could be further strengthened by a lecture on the subject by some competent person. To increase the educational feature of a corn-on-the-stalk display, the stalk should be pulled up so as to show their full height and a sufficient number should be gotten to show the variety, character with respect to such points as height of stalk and of ear, number of ears per stalk, and the general character of the unhusked ear. In addition there should be a brief written statement as to actual yields obtained, length of season required, and the specially desirable qualities of the variety. In some such way as this the real merit of a new variety would be indicated. For a crop like corn, which requires much time for selection, and the varieties of which are apt to get mixed, the best plan is to pay attention to only one variety. For other crops, however, such as soy beans, cowpeas and the like, numerous varieties may be taken and a valuable comparative exhibit made if grown under the same conditions, which should be as far as possible in keeping with usual farm practice.

In the county and individual exhibits there is splendid opportunity not only to advertise the agricultural resources but also to make displays which will be highly instructive. Those of this year were interesting chiefly as showing the wonderful variety of crops grown in the State. In this respect Rutherford County, winner of the first premium, was ahead of any other competitor with respect to both general farm and garden crops. The number of entries listed by this county was about 220 and represented about 190 varieties. A somewhat detailed list is as follows :

Crop.	Number Varieties.	Crop.	Number Varieties.
Barley	3	Tobacco	1
Corn	24	Wheat	4
Cotton	3	Beans	20
Grass and Forage	21	Onions	9
Oats	5	Potatoes	14
Peanuts	1	Tomatoes	3
Rye	2	Miscellaneous (chiefly vegetables)	76
Sorghum	4	Total	190

The Giles County exhibit was in the hands of experienced men who took pride in the quality of the varieties displayed. The arrangement was good, and the exhibit was easily accessible to the public. Here was the best collection of wheats.

Williamson County had the best collection of hays and grasses, and the exhibit was second to none with respect to neatness and attractive arrangement. The lots of wheat were too small. Half bushel lots should be the minimum.

The Coffee County pavilion, along with other decorations, received the merited praise of all. The variety and quality of the vegetable display was excellent. The labeling arrangement and general attractiveness of the articles exhibited could, however, have been considerably improved, and would have given higher standing.

The Montgomery County exhibit of the various commercial grades of tobacco was very complete. The pavilion was second only to that of Coffee County in attractiveness.

The Knox County exhibit was creditable and with the proper support of Knox County farmers and gardners might have been a prize winner.

The Wilson County exhibit was not lacking in variety, but was poorly and unattractively arranged.

In practically each case the county exhibits were the result of only one or two people and as such were highly creditable. Some one should solve the problem of getting the county as a whole interested in the subject.

Some counties seem to be deterred because of the supposed advantages of certain Middle Tennessee Counties. This is not a tenable position. The best farming that the writer has seen is not in the "best" counties. It is the skill of the farmer and the gardner, not the natural quality of the soil that gets the best results. Quality, variety and attractiveness of display are the natural order of merit. Steps are being taken to make the next year's awards fairer to all who enter by making certain allowances to those from long distances and also by placing an extra value on a special crop display, such as tobacco for Montgomery County, or cotton for Rutherford.

AGRICULTURAL EDUCATION.

News and Notes.

THE Department of Agricultural Education of the University of Tennessee, which uses the U. T. Farmer as its organ of publication, invites correspondence with all who are interested in its cause of introducing agricultural education into the public schools of Tennessee for the betterment of both agriculture and education, and it seeks to enlist those who are indifferent. It is hoped that the U. T. Farmer may be useful to all teachers of agriculture and that it may be found in the hands of all rural and village school teachers in the state. It is not intended to make it a journal of educational methods for the great need is in knowledge of agricultural principles rather than of educational principles. The writer believes that the knowledge of agriculture required by the teachers does not differ in kind from that required by every farmer, and the introduction of this department into the U. T. Farmer therefore does not alter the character nor intention of the latter.

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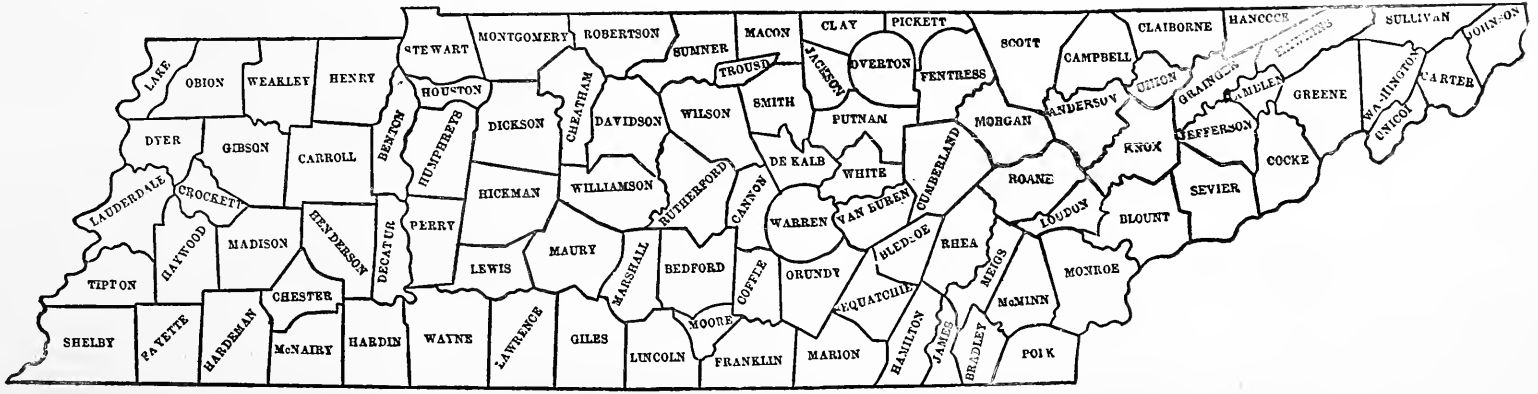
On page 33 of this issue is found a list of the counties of Tennessee which were represented in the Summer School of the South last summer by teachers, each having a free agricultural scholarship from his home or neighboring county. We hope to see the list doubled next summer as the signs of the times indicate a greater need soon of teachers of agriculture in the state than could now be supplied. The movement is national in its scope and educational journals and agricultural journals are alike in advocating agricultural education. At the last session of Congress Representative Davis of Minnesota, introduced a bill providing national aid to agricultural high schools, which has been very favorably received and may become a law. This bill provides the payment of $2,500 per annum to maintain an agricultural course in one high school of each congressional district which shall qualify in certain matters of equipment and educational standard.

Should this bill become a law the state university having the advantage of an agricultural college and experiment station would rightly be looked to as the logical source for the ten teachers for these congressional schools, to say nothing of the many other schools demanding agricultural instruction, and it does not wish to be caught unprepared. But if the same necessity for teachers arises that county superintendents all over the state have to meet the state will be compelled to accept one of three alternatives, namely: teachers who are unprepared may be put into these positions, or the appropriations may go by default or teachers may be imported from our neighboring states which are awake to the need and are already making some progress in the preparation of teachers. Under existing conditions the last alternative would probably be chosen and such schools will be in the hands of teachers better prepared than are ours but who do not know our agricultural conditions so well as do our native teachers.

MAP OF TENNESSEE



Figures indicate the number of representatives each county sent with free agricultural scholarships to the Summer School of the South, 1907

Counties of Tennessee and their representatives having Agricultural Scholarships to Summer School of the South, 1907

Counties	Representatives	Present Address
Anderson	John H. Gammon	Powell Station R.F.D. 3.
	Robert L. M. Wallace	Clinton R.F.D. 2.
Bedford	Benjamin N. Barton	Shelbyville
	Eula P. Carroll	Haleyville, Ala.
Campbell	Mrs. Martha Brown	Jellico.
	Edgar Hermon Smith	LaFollette.
Carroll	Cora Richardson	Cedar Grove.
	John Wesley Williams	McLemoresville.
Cheatham	Willie Bell Pardue	Cheap Hill.
	Lewis Palmer Smith	Ashland City.
Claiborne	George Noble Cupp	New Tazewell.
	James Mayes	Goin.
Cocke	Oscar L. McMahon	Newport.
Coffee	Henry W. Barton	Decatur, Tex.
Decatur	John F. Hughes	Waynesboro.
Fayette	Lela Humphreys	Moscow.
Gibson	Birdie Patterson	Humboldt.
Grainger	Dorsie Bryan	Rutledge.
Greene	Herbert D. Fillers	Greeneville.
	Emily Susong	Greeneville.
Hamblen	Tela Sample	Morristown R.F.D. 3.
Hamilton	James Absalom Roberts	Soddy.
	J. S. Ziegler	Chattanooga, 230 Poplar.
Hancock	Maude E. Brown	Rogersville.
Hawkins	Katherine Brown	Rogersville.
	Mary Lee Maxwell	Mooersburg.
Henderson	Fleetie Richardson	Cedar Grove.
	Grosvena Steele	Sardis.
Henry	Mrs. Carrye Fryer	La.
Johnson	John C. Harper	Mountain City.
	T. Austin Stanton	Butler.
Lake	Will N. Calhoun	Tiptonville.
	Giles Lawson Meek	Medina.
Lauderdale	Moselle Maude Ferguson	Halls R.F.D. 3.
Lincoln	Inda Edens Melson	Mulberry R.F.D. 1.
	Mary Ella Stewart	Kelso R.F.D. 3.
Loudon	Bessie Lenoir	Lenoir City.
McMinn	Zinnia Dickson	Athens.
Marshall	Kate Liggett	Montezuma, Ala.
Maury	E. Alexander Deane	Lynnville.
	Edgar W. McAnally	Mt. Pleasant.
Monroe	Artie Hall	Vonore.
Montgomery	Stone Abernathy	Dogwood.
	Jessie Basford	Hickory Point.
	Mattie Basford	Woodford.
Morgan	Katherine Center	Petros.
	J. F. Love	Knoxville.
	Marion W. Monroe	Burrville.
Obion	Wm. Herbert Winston	Polk.
Polk	Wm. B. Rucker	Ducktown.
Rhea	Thomas Dudley McGaughey	Rhea Springs.
	Wm. Emmet Stephens	Dayton.
Roane	Florence Christenberry	Wheat.
	Lyda Christenberry	Wheat.
Rutherford	John Clay Williams	Coldwater R.F.D. 1.
Scott	Wm. Ernest Gallion	Glen Mary
Sevier	P. Wesley Lamons	Sevierville R.F.D. 5.
	Richard E. Watson	Sevierville R..F.D. 4.
Shelby	Margaret E. Myers	Memphis.
Smith	Milton L. Caneer	Carthage.
	Joe C. Nichols	Chestnut Mound.
Stewart	Sid C. Folks	Dover.
	Wilbur C. Folks	Dover.
	Loyd McElroy	Dover.
Union	Myrtle Longmire	Lost Creek.
	Anson W. Runyan	Maynardsville.
Weakley	Aaron B. Murray	Hyndsver.
	Ora McWherter	Dresden.
White	Mary Low Gilliland	Sparta.

The sixty-nine teachers listed on page 33 represent most of our available material for the teaching of agriculture in Tennessee public schools. While university or collegiate training has come to be regarded as a prerequisite for high school positions, the six weeks short course of last summer is not to be lightly regarded when we consider that some of these teachers are persons of collegiate training in other courses and bring to the work an unusual degree of ability to assimilate, adapt and present a new science and about three-fourths of them acquired agricultural certificates for satisfactory work and attendance.

The correspondence of this department with the foregoing teachers is marked on their part with the greatest enthusiasm and much of it is worthy of publication. The admonition, "Go thou and do likewise," which every zealot is impelled to carry to his brother, has caused the doctrine of agricultural education to be sounded in teachers' institutes all over Tennessee. Among the workers in this cause included in the foregoing list we note the following who have spoken one or more times in their home or neighboring counties: P. W. Lamons, Sevier; Miss Dorsey Bryan, Grainger; W. H. Winston, Obion; John Clay Williams and Miss Inda E. Melson, Lincoln; George Noble Cupp, Claiborne; John C. Harper, and T. Austin Stanton, Johnson; M. L. Caneer, and J. C. Nichols, Smith; E. W. McAnally, Maury; Miss Tela Sample, Hamblen; Miss Emily Susong, Greene; Miss Bessie Lenoir, Loudon; B. N. Barton, and Miss Eula P. Carroll, Bedford; J. F. Hughes, Decatur. The number who are teaching agriculture in their schools should also be mentioned but for the inability to name them all for the lack of space. County superintendents not having home teachers prepared to discuss the subject may by reference to the list find some one in a neighboring county who is able and willing to present the matter to their teachers.

* * * * * *

With or without national aid the agricultural high school is sure to come. Some states already have them with state or county support or both and many more are making efforts to get them. The Tennessee system of county high school boards, where such men are favorable to the cause, is one of the best for the establishment and maintenance of county agricultural high schools, and the board in Hamilton county, in providing its four new high schools at various parts of the county, has made the one at Tyner, which is to be dedicated this month, distinctly agricultural in its ideals and equipment. The principal of this school, J. W. Abel, is a university graduate who secured an agricultural certificate for his work here last summer, and his assistant in science and agriculture is V. S. Bright, a graduate of the four years' agricultural course and business manager last year of the U. T. Farmer. This congressional district is therefore ready for its $2,500 national appropriation should the Davis bill become a law as it has in this school what will be expected in the Congressional school—an agricultural graduate at the head of its agricultural work and with coordinate courses in charge of equally competent teachers.

EDITORIAL.

This issue of the U. T. Farmer is devoted mainly to the Tennessee State Fair held in Nashville, September 23 to 28, 1907. In recognition of what constitutes a successful fair—and the one at Nashville was a truly remarkable exhibition—much space is devoted to articles pertaining to stock and breeds, and which are replete with the lore of the stock man.

As a layman (school teacher for instance) you might ask what value or even interest is this to you, and if the scrubs, runts, and plugs which you pass every day do not answer the question, consider what man has achieved during the time he has had possession of the planet that is a better monument to his genius and an excuse for continuing his lease than the farm animals which he has bred up from ancestors little better than those now hunted only as game. And if anyone asks you in what school or institution this nice art of accurate breeding has been fostered you will find that it owes nothing to the schools and colleges but has survived strictly on its merits.

Therefore, though animal husbandry may suggest to you hayseed and muddy boots and stable odors, and sometimes even grammatical sins, it calls for the finest quality of brains to maintain the poise of the present nicely balanced pure bred strains, a single mesalliance of which might wreck the work of generations. Any false syntax that belongs to the art should be a rebuke to the schools.

The Farmer takes pleasure in presenting as a frontispiece, photographs made by Mr. F. H. Broome, of the Experiment Station, of what is doubtless the best Jersey bull and cow in the country. Standing first in their respective classes, they were three weeks later entered in the National Dairy Show at Chicago, where they were awarded first places as grand champion male and grand champion female in the swiftest company that prizes and honors can bring together, and while this show was on at Chicago, Van Natta's herd of Herefords which was so admired at Nashville was taking first in the two-year-old males on his Prime Lad 9th and in two year old cows on Pretty Face, besides numerous awards of lower rank at the Royal Stock Show at Kansas City.

A call has been issued for the organization of a State Dairymen's Association to meet at Nashville, the first week in December, during the meeting of the Middle Tennessee Farmers' Institute. This is an indication of the general interest in dairy work in the state and is a live agricultural problem.

Matter pertaining to agricultural education whether intended for publication in the Farmer or not should be sent to Prof. Josiah Main who has charge of that department.

PERSONALS AND ALUMNI.

L. R. Neel, B. L. A., '07 is farming near Gap Mills, W. Va.

E. F. Fuller, B. L. A., '07, is engaged at farming at his home near Morristown, Tenn.

W. Vance Carpenter, Ex.,'09, is working for the Tennessee Fertilizer Company at Columbia, Tenn.

Vassar L. Bright, B. L. A., '07, is teaching agriculture in the Hamilton County High School at Tyner, Tenn.

Prof. C. A. Mooers has returned to meet his classes after spending two weeks in Middle Tennessee doing institute work.

Prof. H. A. Morgan, Director of the Station, is back on the Hill after several days confinement with sickness at his home.

S. A. Koger, a 1907 short course star, was down this month to visit us. He was out at the University Farm with the famous Koger Pea Thrasher, which will soon be on the market.

A. T. Anders returned to the universaty the middle of the month to complete his undergraduate course in agriculture, after spending about four months in West Tennessee and Arkansas assisting Prof. S. M. Bain in his cotton breeding work.

Prof. Josiah Main has made several visits to nearby counties visiting county superintendents and addressing educational gatherings in the interest of agricultural education. He reports a very friendly feeling toward the university and its efforts toward building up a better agricultural sentiment. They are giving a very substantial aid to his department.

The students of the agricultural courses met Wednesday night, Nov. 13, and reorganized the Agricultural Club, by the adoption of a new constitution and election of the following officers: A. T. Anders, president; R. M. Murphy, secretary-treasurer, and J. C. Clark, sergeant-at-arms. A large number of students were present as well as sevseveral of the faculty who are much interested in the Club's success. Regular meetings of the Club will be held every first and third Wednesday night of the month.

The following 1907 short course men are employed as indicated: C. H. Barnes, who worked for the Experment Station Dairy for several years, is now associated with his father in a transfer company at Corpus Christi, Texas; Charles Smith, who specialized in bee culture, is on his farm near Rogersville and is interested in cattle breeding; Stephen Spangler is one of the assistants in plot extension on the farm here; Frank West is reading proof for the Knoxville Sentinel; William Bain has charge of a part of the dairy work at the farm.

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Subscriptions, 50 cents per session—9 numbers, 10 cents a copy, to be paid in advance.

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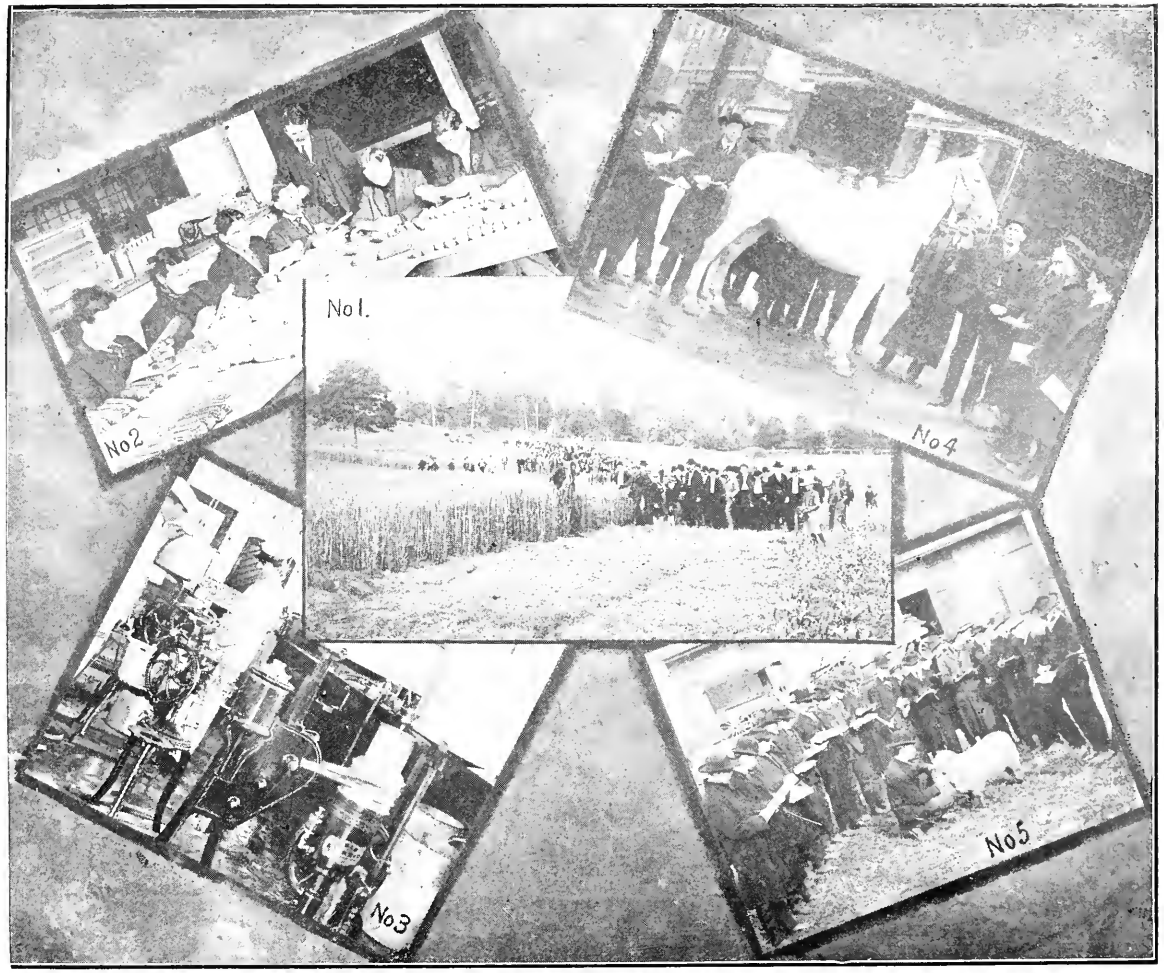


SCENES AT THE UNIVERSITY OF TENNESSEE DURING THE AGRICULTURAL SHORT COURSES

1—Farmers Visiting the Experiment Station Farm. 2—Lesson in Seed Corn Selection. 3—Students Handling Cream Separators in the Dairy, 4—Horse Study. 5—Scoring a Profitable Sheep.

[*Courtesy of Southern Agriculturist.*]

THE U. T. FARMER

Vol. 2. DECEMBER, 1907 No. 3

THE FARMER'S SCHOOL.

SHORT courses in agriculture during the winter months, when the farmers may arrange for a few weeks' study of the principles which underlie their business, have been demanded all over the country. In the North and West these schools for the farmer have been very popular and the attendance has increased each year. The results have been far-reaching in developing a line of practice on the farms of the country in keeping with methods suggested by the sciences which underlie agriculture and in stimulating a pride in rural life and activity hitherto unknown.

It is natural that our farmers should look to our agricultural colleges and experiment stations for assistance. Almost without exception have practical courses been arranged and offered by the state institutions having charge of agricultural instruction and experimentation.

In Tennessee the College of Agriculture of our University has given for a number of years winter courses for farmers, and last year gave during the session of the Summer School of the South a short course for the public school teachers of this State. The farmer's course until last year extended over a period of eight or ten weeks, but, realizing the need for specific courses which might be taken in a shorter time, the University has divided the entire course into periods of two weeks each, thus enabling the farmer interested in the breeding or feeding of live stock, or in crop production, to get all the work given in these lines without losing the time to take work not directly connected with his home operations. This division of the courses has met a popular need without in any way decreasing the efficiency of the work. This year the work has been outlined as follows:

January 2—January 15

Course I.—Studies of Tennessee Soils, Tillage, Fertilizers, Crops, Rotations, Insect Enemies, and Plant Diseases; Selection and Score Card Judging of Corn and Cereals.

January 16—January 29

Course II.—Studies of Breeds and Breeding of Live Stock, Feeds and Feeding; Score Card Judging of Various Breeds of Animals; Diseases of Live Stock.

January 30—February 12

Course III.—Study of Dairy Breeds; Score Card Judging of Dairy Cattle; Crops for the Dairy Herd;; Proper Handling of Milk; the Processes of Butter and Cheese Making; Diseases of Dairy Cattle.

February 13—February 26

Course IV.—Fruit and Vegetable Growing, Soil and Location; Varieties; Culture, including spraying for insects and diseases, fertilizers, propagating, and pruning; Marketing and Markets.

February 27—March 11

Course V.—Study of Various Breeds of Poultry; Score Card Judging of Poultry; Handling of a Poultry Plant, including operation of trap nests, incubators, brooders, etc., caponizing and feeding of poultry and treatment of diseases.

February 27—March 11

Course VI.—Study of the Habits and Development of the Honey Bee; Types of Bees; Management of an Apiary; Types of Hives; Culture of Bee Plants.

February 27—March 11

Course VII—Domestic Science, including study and preparation of human foods, and food rations; Home Adornment. Dairy, Poultry, Bee Culture and Horticulture.

The first two courses are for the general farmer, whose interest is primarily in soil fertility, crop production and rotations, and the breeding, feeding and management of live stock; while Courses III, IV, V and VI are for those following such special lines of agricultural work as dairying, horticulture, poultry, and bee keeping. Course VII considers the relation of the home and its economic management to the success and happiness of life on the farm. To those who find the time to take the entire work the courses have been so arranged as to permit this without duplication.

To enlist a greater interest in the farmer's school and the benefits to be derived from it, the East Tennessee Farmers Convention, one of the oldest agricultural societies in the United States, has offered a premium of $100.00 to the county sending the most students, the money to be divided among those from the successful county; provided eight or more attend. The Tennessee State Fair Association offers $75.00 as a second premium for the same contest. Many prizes are offered by friends of agricultural education for proficiency in various lines of study.

The courses are offered free, and without educational restrictions. Every one interested in the study of farm problems, whether of the soil, the crop, the animal, or the home, is welcome.

The State Commissioner of Agriculture intends holding at an opportune time during the first two courses a farmers' institute meeting at which special lectures on important and timely agricultural topics will be given.

The facilities offered by our College of Agriculture and Experiment Station in practical laboratory and field demonstrations are unsurpassed. The Station farm, with its many lines of experiment work in field and orchard crops, fertilizers, rotations, feeding, and breeds of stock, is at

the disposal of the short course students. Practical lessons in the use of the score card in judging corn and cereals, beef and dairy cattle, sheep and hogs and poultry, as well as demonstrations and lessons in planting, pruning, grafting, budding, and spraying of vines and fruit trees, are especially emphasized.

The State's future lies largely in her agricultural activty and achievement, and every movement which has for its object the broadening of the horizon of those on the farm is an important factor in our State's development.—[From the Southern Agriculturist.]

A SUCCESSFUL PEA AND BEAN THRESHER.

AMONG the most valuable and necessary crops that the South can produce are the various members of the cowpea and soy bean family. Not only are they valuable as a feed for all kinds of live stock—in this respect they are believed to be equal if not superior to corn—but they add to the soil one of the most costly elements of fertility, nitrogen.

Nitrogen there is all about us; 77 per cent of the air we breathe is made up of this element, and it enters largely into all animal and plant life, especially the latter. Its evident abundance, however, is one thing, and the compounds containing it in a form available for consumption as food in plant life are another. The farmer has long since discovered at the expense of his bank account that any crop or method of farming that he can adopt which will add to or conserve this most valuable of all fertilizers is much to his advantage. The legume family, to which the cowpea and soy bean belong, is the only group of plants that will directly convert the nitrogen of the air into soluble nitrates for available plant food, and it is the only farm crop that will leave the land in a better condition with respect to nitrogen content than it was before the crop was planted.

Experiment stations everywhere strongly recommend the culture of soy beans and cowpeas. The farmers all admit the value of these crops, both as a fertilizer and a feed, but in all cases state that the chief reason why they are not more extensively grown is that they are too hard to cure and handle. If cured as hay and stored in the barn or mow, the long vines are difficult to handle; if run through the feed cutter, the peas are all shelled or broken, and there is a large percentage of loss. This loss of the most nutritious part of the plant is certain whether the vines are fed whole or chopped.

It would seem, then, that if a machine could be invented that would separate the grain from the straw as wheat is separated, and break up the long vines into convenient lengths for handling, storing, and feeding, one of the chief difficulties of raising and feeding cowpeas and soy beans would be removed, and the grain could be ground and fed as meal separate from the straw, thus avoiding any loss or inconvenience what-

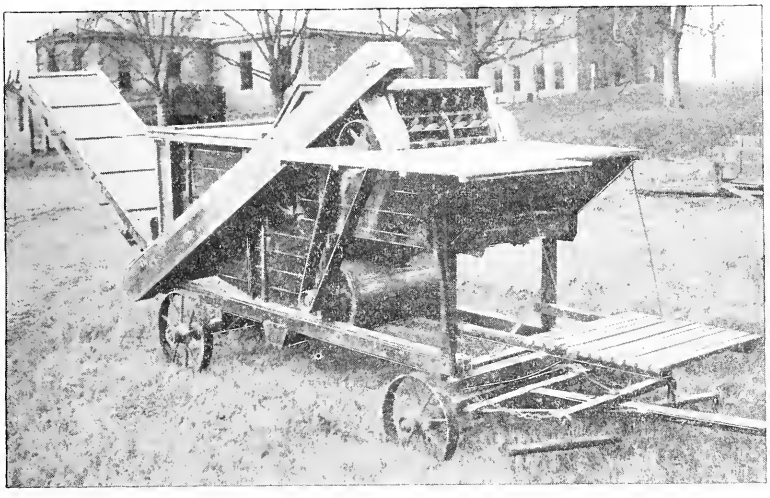
ever. Toward the perfecting of a machine that would successfully separate the grain from the straw the genius of the inventive American has long been directed, but until recently, without complete success. In almost all cases inventors have used the principle of the ordinary threshing machine—that of a cylinder with a square-faced spike-tooth engaging similar teeth in the concave bar and the usual array of shakers and separation devices. The result has always been the same. If the cylinder is run fast enough to remove all of the beans from the pods a large per cent of them are cracked. Further, unless the vines, which are usually long and tangled, are very dry, they will wind up and choke the cylinder. The underlying principle of the whole question lies in the fact that if the cylinder is run so slow that the peas are not cracked they are not separated; in other words, they are pulled through too fast to be all knocked out of the pod. The pea thresher must involve the principle of the old-fashioned flail; the peas must be pounded out of the pod, not ground out. Some inventors have used two cylinders, both on the principle of the ordinary threshing machine, one being situated in the usual position on the front, and the other near the back of the separator; all of the straw passing through both. This was better but did not fill all requirements.

A machine has recently been invented by Dr. J. J. Koger, of Rogersville, Tenn., which has apparently solved the problem. In outward appearance the machine resembles the ordinary grain separator. The cylinder is 16x30 inches, provided with the same number of teeth as the grain thresher. These teeth, however, while they have the same general shape as the spike separator tooth, are rather longer and wider, and the front of the tooth is drawn down to a knife edge. Thus the cylinder looks as though the regular spike teeth had been replaced by very large and heavy shoemaker's knives. The concave teeth are like those in the cylinder, except they have 1-4 inch separations, or notches, in the cutting edge, making them resemble a section of a very large ripsaw. It is in the knife-edged cylinder teeth and the placing of the notches and sharp-edged concave teeth that lies the secret of Mr. Koger's pea-thresher. There are two rows of concave teeth at the front of the cylinder, or at the end of the feeding board. There is another set of three rows of concave teeth at the back of the cylinder almost opposite the first two rows. This leaves an interval of almost half the circumference of the cylinder between the two sets; it being rememberd that this open space is on the under side of the cylinder, just above the shakers.

Now, what happens during separation? The tangled vines and peas are fed into the first set of concaves. The vines are broken or cut by the knife teeth of the cylinder and concaves, and a large share of the peas threshed out of the pods. While the knives cut the vines and pods, they do not run close enough together to cut the peas, and there are not abrupt, square edges against which the peas can strike and break. There is no grinding as with the spike tooth. The notches in the concave hold the

vines and pods long enough so that a large per cent. of the peas are threshed, and the vines are cut. After passing through this first set of concave teeth, the straw drops down into a device for re-feeding into the second set of teeth at the back of the cylinder. This re-feeder is attached to the shaker and has much the same motion. The re-feeder in turning the straw over shakes out the loose peas, and throws the straw up into a second set of concave teeth, which removes any peas there may be left in the pods and cuts the straw into the proper length for convenient feeding—usually about 4 to 6 inch lengths. After leaving the cylinder the straw goes through the usual separating devices. The straw is elevated to the stack or wagon, and the clean-threshed peas are conveyed to the sack or bin.

Another feature of this machine is a flat feeding table. The vines are not fed into the cylinder as in the ordinary threshing machine, but are fed on a level plane, so that the cylinder will only get what is fed



KOGER PEA AND BEAN THRESHER

into it, and there is no tendency for the cylinder to pull the vines out of the feeder's hands too rapidly to be separated properly.

Dr. Koger discovered the right principle. The Station threshed 200 bushels of cowpeas and soy beans, of which there were 10 varieties of soy beans and 8 varieties of cowpeas. The vines from which this grain was threshed represented all degrees of toughness and stages of curing. This was due to experiments in the curing of cowpeas and soy beans that the Station is carrying on this year. Some of the vines had heated and were in the worst possible condtion for separation. In these lots the machine separated a surprisingly high percentage—more by far than a wheat machine would have done with wheat in a similar condition. In those lots that were dry the separation was very complete.

From the work done on the Station farm it would seem that Dr. Koger's machine is a complete success. It will be improved, however, in

minor points as in separation. It is earnestly to be hoped that the Koger pea thresher will soon be manufactured and placed on the market so that it will be within the reach of all sections where the cowpea is grown. With this means of conveniently handling the cowpea and soy bean there will be little excuse for their not being more extensively cultivated.

AN ANCIENT TEACHER OF AGRICULTURE.

ZOROASTER, the great moral teacher of ancient Persia, lived perhaps as early as 1000 years before Christ. His fame as a religious leader and reformer is world-wide. His sermons, which have come down to us essentially as he delivered them, give a most profound impression of the author's exalted spirituality and keen analysis of the moral questions of his day. Although the author was gifted with a poetic temperament, yet his every utterance is practical and instinct with common sense, and he has an unfailing power to see things in their proper relations.

But the Zoroastrian teaching had a special phase which seems to be almost unknown to the general reader. I refer to the ever recurring emphasis that Zoroaster puts upon the imperative need of agricultural reform in the way of a more rational attention to land and animals. Like all intensely earnest and enthusiastic characters, he sometimes grew indignant. On one memorable journey he applied for lodging and was turned away; whereupon he seems to have regretted his own exclusion less than the fact that his tired oxen were shivering in the cold instead of resting in a comfortable stable. In Zoroaster this indignation was not mere sentiment, but rather an example of his usual practical and reasonable way of looking at things. His sermons are full of exhortations to his congregation on a more intelligent agriculture and animal husbandry as perhaps their most important religious obligation. In fact, he makes it clear that happiness in the next world will not be attainable unless this obligation shall have been faithfully met.

The material basis of this appeal had a powerful influence on the practical-minded civil authorities, and their consequent hearty co-operation had much to do with the successful propagation of the Zoroastrian religion.

As to the details of the agricultural reform that was demanded, little is known; but there are indications that the land had been abused through nomadic habits by cultivating and pasturing a certain tract until it was about worn out, and then going to another only to treat it in the same way.

These facts may serve to remind us that most problems are both new and old, belonging equally to the morning and the noontide of the world. We may well be cautious in declaiming on the newness of things.

Charles H. Shannon.

SOME IMPRESSIONS OF THE 1907 INTERNATIONAL.

The eighth International has come and gone. Now that we have time to catch our breath and measure our thoughts, we are lost in wonder at the magnificent display that we have just witnessed. We have seen gathered together under a single roof of the Union Stock Yards at Chicago tangible evidence of the breeder's genius, not only from the Western Continent, but from many of the European countries as well. The Breeder's Gazette of December 11 touches the keynote that will call forth a hearty response from every visitor to the International when it states:

"The International of 1907 is compassed in description only by superlatives. Adjectives have been exhausted in former years, and repetition can be varied only by the use of terms in the superlative degree. Measurably larger in magnitude, this year's exhibition was distinctly more magnificent in nearly every detail that entered into it. In the face of conditions which have menanced the business world, checked the wheels of commerce, and distinctly touched the live stock industry with discouraging hand, the eighth International has mounted to heights hitherto unattained. Well may the record awaken wonder. That it has been thus written gratifies pride, satiates ambition, and stimulates hope for yet grander realization. Everyone who had a part in contributing to the glory of the December live-stock show has discharged acceptably a public duty and earned that reward which is won by an obligation faithfully fulfilled. As a climax of an unprecedented series of fall fairs and shows, the Chicago exhibition measures up to the highest expectations, the fondest hopes of its promoters. It is an imposing milestone on the path of progress of the live stock industry."

The increased popularity of this year's International in the face of adverse financial conditions is proof conclusive that breeders are coming to recognize it as a great educational institution, or rather as an institute of art where the members of the "Live Stock Fraternity" may go and see the various artistic creations in flesh and blood given appropriate setting, where the achievements of the breeder's genius may be studied and compared. Aye, my friend, laugh if you will at the notion of art in the raising of cows and pigs, but just pause with me for a moment at the ring side and look at that magnificant specimen of the Shorthorn breed so proudly wearing the blue. Did the perfect lines and curves of that superb form arise by chance? Could the genius of the great painter place on canvas a more perfect form? The Grand Champion of the 1907 Exposition is the result of the conception of the highest ideal of any art and represents long years of breeding, selection, and careful feeding. The breeder's is the highest art because he is dealing with the forces of Nature, a stream of life that he can only direct in a limited way and never control. He is dealing "with a bit of matter temporarily endowed with life as fleeting as a breath; any service that it may render us must be caught in the passing." The path of the breed improver is marked by many hardships and disappointments, but determination and good judgment,

together with a certain genius for the work, will win out in the end. Few people realize the true meaning of the breeder's work, and in this, the International is doing a great work. Much, however, is yet to be learned.

With each succeeding Exposition it becomes more apparent that the breeders are coming closer together in the various associations, to the lasting benefit of the breeds which they represent. Well it is, that this is being done, for it is only through the most confidential relations that the breeders can hope to achieve the best results.

Breeding in its restricted sense involves rigorous selection. The exceptional individual upon which all breed improvement depends does not arise from a limited distribution; perhaps there is not one individual of this kind in a thousand, and surely it would be difficult to predict the advent of such a one in any single herd or flock. Before the business of breeding will be at its best there must be community of interest. Let all of the people of a single community breed the same breed, and type of farm animal so that there may be an interchange of sires. In this way the exceptional individual will be productive of the greatest amount of good for the breed as a whole. The isolated breeder is developing a strain that represents his ideal of form or function. As he goes forward in the work he finds his path ever narrowing; he finds it more and more difficult to obtain sires that will improve or perpetuate the desirable qualities that he has originated. Eventually he reaches a point where improvement ceases. Retrogression must follow, a dispersion sale is held, and the result of long years of work is scattered to the four winds. Let a community become interested in the same line of breeding; then will the numbers be increased so that the greatest possibilities of the breed will be realized. This is the only solution of one of the most difficult problems of breed improvement, and the International Live Stock Exposition at Chicago is slowly paving the way. To a certain extent, the contrast between the work of the individual and that of the community is shown in the early development of the Shorthorn and Hereford breeds. The one was developed by different breeders, each after his own ideal. Consequently there is a diversity of type that is not found in the Hereford. In the latter the development was accomplished in a community where all were interested, where numbers were large enough to practice selection rather than close breeding. As a result we have a more uniform type in the Hereford. This evidence alone would go far toward proving the value of community breeding.

The International will be held again in December 1908. Let us all meet at the ring side and be eduated in the art of arts, and at the same time cheer the U. T. Judging Team to victory. F. C. Quereau.

THE AMERICAN FEDERATION OF STUDENTS OF AGRICULTURE.

This year Tennessee had its first representation at the meeting of the American Federation of Students of Agriculture, held in Chicago during the week of the International. The object of the Federation is to bring together

students from all Agricultural Colleges. Not all colleges were represented this year. Texas, Washington, Ontario, and Tennessee brought four corners of the country to Chicago to help out the closer-by institutions and make the meeting a great factor of the Live Stock Show. The position the colleges take at the International is well stated in the following citation from the Breeder's Gazette, Dec. 11 issue:

"The agricultural college has made the International one of its elective courses. We do not know how otherwise to state the situation so concisely and comprehensively. The prominence of the college is most manifest. With students judging contests, with exhibits of college stock in all sections for butchers' animals and in some of the breeding classes, and with professors in charge of departments and on the judging benches, and with large and lusty-lunged delegations of students from far-sundered states, a decided college atmosphere invests the International. The records contain the results of the participation of the colleges in the show. Here is a partial roster of the attendance of students from various institutions, an approximation rather than an accurate count: About 125 students came from University of Illinois; nearly 400 wore Chicago Veterinary College Colors. The Missouri, Minnesota, North Dakota, Cornell and Texas colleges were represented by 10 to 15 students each. Large delegations from the Iowa and Wisconsin colleges were present, Iowa sending about half a hundred. In the students' judging contest the Missouri, Kansas, Ohio, Texas, Ontario, South Dakota, Washington and Iowa colleges were represented."

The Federation constituting three students from each college was called to meet Tuesday, Dec. 3, at 5:00 p. m. in the Saddle & Sirloin Club, Union Stock Yards, Chicago. The principal business was choosing the management for 1908. This fell to Wisconsin by lot, with Ohio alternative.

The Michigan fellows handled the Federation very successfully this year and had ready for us a sumptuous dinner, to which all went after adjournment. All agricultural students and alumni were allowed at the banquet. Songs and yells were much in evidence during the evening. A well selected toast list was the treat of the occasion. Prof. Carlyle, of Colorado, toasted "The Naturalization Papers of the Horse;" Mr. M. E. Teeter, Ind., "The All-Around Student;" Prof. Wing, Cornell, "The Durham Ox;" Mr. Reid, Mich., "The Cattle Boat" and Mr. Kildee, Iowa, "The Future."

Tennessee's delegation says we must be represented every year hereafter. It is not to early for us to begin thinking of the Ninth International. It would be great to send a judging team, but this is not the all important. One thing should be done, that is, allow the students who attend the Fat Stock Show a good strong credit for the work they do there. To any student with a year's work in breeding and judging it is worth some credit in animal husbandry—that's all. See to it now that the credit is given and every student resolve, "I will be there next year." Not until this is done will Tennessee's yell echo in "Packingtown" from one year to the next.

D. C. Parman.

MY EXPERIENCE WITH ALFALFA.

I am giving below a short account of my experience with the culture of alfalfa which I hope will be of interest and benefit to the readers of this paper.

Preparation—First I plow my ground in spring, when plowing for corn, and work it at every opportunity I can with disc and drag harrows until August. By treating in this manner, I get my ground well prepared, conserving moisture and destroying weeds. I also use slack lime from a tannery and also ashes. I cannot see much difference between ashes and lime as I have found that alfalfa grows fine from either one. At first I did not use any fertilizer but now I use 300 lbs. of 8-4-2 fertilizer.

Seeding—I allow from 25 to 30 pounds of seed to the acre, being very particular to get the best seed I can. I sow the seed both ways, half each way. I sowed six acres the 20th of August and 2 acres the first of September. With the two acres, I mixed 8 lbs. of red clover with the alfalfa and now I have a fine stand of each and if nothing prevents, I am figuring on getting a large crop of hay from the first cutting. In all, we have about 26 acres in alfalfa.

I find that alfalfa stands freezing much better than red clover as it is the last crop seen green and the first in the Spring green. I have a combination of alfalfa and timothy which we cut this year. The first crop was immense, the hay stood about three feet high just before cutting. This piece is raised on soapstone land. As to inoculation, the worst failure I have ever had was when I used this practice. I do not put much faith in it.

The first acre that we sowed, I cultivated in corn this year and we gathered 63 bushels of shelled corn against 45 to 50 bushels per acre which we have been accustomed to get. Neither did we use any fertilizers on this acre where heretofore we have used about 200 pounds. I find the best roots where we call "red knolls." From what I can see after nine years experience, alfalfa is one of the best land restorers.

So far we are the only ones having any success with alfalfa in this immediate section, for the reason that anyone wishing to start a stand of alfalfa is obliged to sacrifice a crop to do so and this is one thing that farmers will not do. There are a great many farmers who say they want to get a crop of pea hay or millet first and by the time they do this, it is too late to sow alfalfa, so if one wishes to get a start, they have to sacrifice one or the other. If farmers will try as I say, I think they will be winners. There is nothing better for manuring alfalfa than stable manure.

We have kept close account of our crops and find that they average about 7 tons to the acre.

To anyone wishing any further information about alfalfa otherwise than given above, I will gladly give it if he will write me.

Johnson City, Tenn. W. J. Bush.

PRIZES OFFERED SHORT COURSE STUDENTS.

COUNTY PRIZES.

The East Tennessee Farmers' Convention and Institute offers $100.00 for the county sending the largest number of students to the Short Courses (Knox County excepted); the money to be divided equally among the students from the successful county; provided eight or more attend from that county.

The Tennessee State Fair Association offers $75.00 to the county sending the second largest number of students—the conditions being the same as for the first prize.

INDIVIDUAL PRIZES.

Prizes will be awarded to individual students for the best work in the different courses, as follows:

$20.00 in gold, awarded to the student taking the entire ten-weeks course who attains the highest average proficiency; given by a friend of agricultural education.

$10.00 in gold, awarded for proficiency in judging light horses; given by Hon. Edward T. Sanford, Washington, D. C.

$10.00 in gold, awarded for the best essay on fertilizers with special reference to the value of potash; given by the German Kali Works, New York, N. Y.

$10.00 in gold, awarded for the best essay on the value of commercial fertilizers in the building up of poor land; given by the Virginia-Carolina Chemical Co., Atlanta, Ga.

$10.00 in gold, awarded for proficiency in farm crops and farm management; given by Mr. Wm. S. Myers, New York, N. Y.

$10.00 in gold, awarded for proficiency in breeds and breeding; given by Mr. Wm. S. Shields, Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in feeds and feeding; given by Messrs J. Allen Smith & Co., Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in the handling of cream separators; given by the DeLaval Separator Co., New York, N. Y.

$10.00 in gold, awarded for proficiency in judging beef cattle; given by the East Tennessee Feed Co., Knoxville, Tenn.

$5.00 in gold, awarded for proficiency in judging dairy cattle; given by the Hackney Feed Co., Knoxville, Tenn.

$10.00 in the bee keepers' supplies, awarded for the best essay on Why Bee Keeping Should be Encouraged in Tennessee; given by The A. I. Root Company, Medina, Ohio.

AGRICULTURAL EDUCATION.

Two from Texas.

Miss Augusta Lawrence, of Huntsville, Texas, writes a cheery note signing herself "with grateful appreciation of the courtesy and consideration shown by all members of the Department of Agriculture to the Texas stranger in the Summer School" and backs her assertion by payment of a year's subscription to the Farmer. We are convinced that she correctly represents the state of her feelings in the matter and are open to conviction from any one else.

In a letter, Henry Barton, Principal of the High School at Decatur, Texas, and a member of last summer's agricultural class, says:

"I grow more and more interested in Agriculture every day. I have a class here of about 35 and it is difficult to tell which is the more interested, teacher or pupil. We have a period of 45 minutes per day, and I believe the class could use one and a half hours without showing any signs of being tired. There is another grade seated in my room, but they give the same attention to the recitation as the class. Before attending school at the University this summer, teaching agriculture was a task, but now it is my greatest pleasure.

I made a talk at an institute here before a hundred or more teachers and received very close atention. I also made a talk in school a few weeks ago to about 400 pupils on insects and insect enemies; they listened like they were hypnotized.

I expect to return to my home county (Bedford) in June and spend the summer with you again, bringing everybody I can with me."

Reasons for Teaching Agriculture in the Public Schools.

1. To cultivate an interest in and instil a love for land and the occupation of agriculture.

2. To create a regard for industry in general and an appreciation of the material side of the affairs of a highly civilized people.

3. To cultivate the active and creative instincts as distinct from the reflective and receptive that are otherwise almost exclusively exercised in our schools.

4. To give practice in failure and success, thus putting to the test early in life the ability to do a definite thing.

5. To train the student in ways and methods of acquiring information for himself and incidentally to acquaint him with the manner in which information is originally acquired and the world's stock of knowledge has been accumulated.

6. To connect the school with real life and make the value and need of schooling the more apparent.

7. As an avenue of communication between the pupil and the teacher; it being a field in which the pupil is likely to have a larger bulk of informa-

tion than the teacher, but in which the training of the teacher will be a help to more exact knowledge.

This work is not to be confused with Nature Study. Nature Study is observation work. This is more; because it requires that something definite be *done* before observation or record can begin. It is thus eminently active, and by its use the pupil visibly alters the order of events, which is more stimulating to active development than the mere observation of natural phenomena or bare acquisition of facts that have been discovered and recorded by others. Remember that the object of the school is to turn out trained and *active*, not *passive*, young people. To *do* is as important as to *think* and to to act to a purpose means as much as to think logically. The logical conclusion of trained thought is trained action, and if action is to be successful it must be exercised and trained at the same time while the pupil is engaged in acquiring facts and while the powers of reflection are undergoing development.

Every real teacher craves the opportunity to bring a part of real life and of the world outside into the daily experience of his pupils. Here is a bit of the world spread out where everybody can see it and study its meaning—a wonderful laboratory for the making of men of action *no matter what their future profession.*

Do not think in this that you are teaching a profession of which you know little and may care less. You are not teaching a profession; you are training men. The business of the common schools is not to teach professions, but to impart the rudiments of trained activity, and in leading pupils through these exercises you are introducing them to a phase of real life and thereby developing their powers of activity along original lines. They will not learn the less from books because of it—they will read the more. A new motive for learning will have been shown them—a new reason for schools and they will pass unconsciously from the passive to the active state, and a new life will possess them both during the school days and afterward, for all that they have learned will be tinctured and enlightened by what they have done.—[Dr. Eugene Davenport.]

The foregoing reasons for the teaching of agriculture in elementary public schools are so well stated that we cannot do better than insert them unaltered. Were we to alter them it would be to insist that teachers should have a larger bulk of information than the pupil, to say nothing of the necessity of her having a comprehensive view of the whole subject and a knowledge of the underlying principles of cultivation, fertility, feeding and breeding. We might also add more emphasis to the distinction made between Nature Study and Agriculture, for we believe that the failure to see this distinction is impeding the progress of this reform.

It is a significant fact that Dr. Davenport, who is dean of an agricultural college and director of an experiment station, and as such, thoroughly committed to the cause of educating boys for the profession of agriculture, has so well assumed the position of the broad minded educator that he is, as to state better than has any school man the value of agricultural education from the purely educational view point.

EDITORIAL.

The Middle Tennessee Farmers' Institute, which met in the capitol at at Nashville, Dec. 4, 5, 6, had a very interesting and what doubtless will prove a very beneficial meeting. Large and eager audiences of the farmers attended every session and the speakers were among the best agriculturists of this and neighboring states. The University of Tennessee was represented by Professors Morgan and Bain. A notable feature was the very apparent disposition on the part of these farmers to assert themselves politically more than they have done heretofore, and more than one speaker suggested to them the possibilities of letting legislators—state and national—know both before and after election what the farmers of each locality think of existing, pending or proposed legislation, in the same manner that other crafts and guilds do so effectively.

This spirit was reflected vigorously in the twelve or more resolutions and is prophetic of the rapidly approaching day when agriculture will appreciate its own respectability and accord itself the dignity as a part of the industrial system that poets, moralists, and philosophers have always accorded husbandry of all kinds. Other features of these resolutions specially interesting to us are those acknowledging or declaring "the aid which the College of Agriculture and Experiment Station of the University of Tennessee have been" to the agriculture of the state; "that a State Fair is an indispensible adjunct to the Agricultural College and Experiment Station;" and that "efforts to increase the efficiency of our public school system are praiseworthy" and "as the preponderance of the population of the state is agricultural the suggestion of Hon. John Thompson, Commissioner of Agriculture that agriculture be taught in the public schools, is most appropriate."

Prof. Herbert Mumford, of the University of Illinois, favors the Farmer with a copy of his recent book, "Beef Production," which is published by the author. We have known of this book for some time through the favorable comment it has received, as we have also known of the author's success in the Beef Cattle Department at Illinois and of his work in organizing a systematic method of classifying market cattle out of the confusion of terms which formerly prevailed on the Chicago market.

Our readers will doubtless watch with some interest the contest for short course prizes, announcement of which will be found in this issue, the honor of winning which may redound as much to the person who may help give the incentive as to the one who gets the money. We shall endeavor, therefore, in reporting results, not to forget our good friends who win by proxy.

The delay in issuing the November Farmer which was caused by a printers' strike has affected this issue to a less degree and we have reason to hope that we are going to get back to the regular schedule soon.

ALUMNI NOTES.

Send your contributions for this department to Lake R. Neel, Gap Mills, W. Va.

H. T. Moss, Short Course, '07, is engaged in stock farming in Smith County, Tennessee. He believes the Short Course is the proper thing and is working for it this year.

W. M. McFadden, Short Course, '04, is engaged in general farming near Warren, Tenn. This is out of the ordinary, as he is in the cotton belt. His cotton this year will average about 1 1-4 bales per acre while the average for the county is about 1-4 bale. He has recently purchased a short horn bull of R. P. Hite & Son, of Gallatin, Tenn.

A. N. Miller, Ex. '08, who was prevented from completing the agricultural course, is running the home farm not far from Murfreesboro, Tenn. From the amount of work he is getting done on his place, he must be as energetic and enthusiastic a farmer as he was a student of the University. That "Shorty" will "make good" we have no doubt.

Now is the time for the Alumni to do some work towards making the Short Course a success. You have been greatly benefited by the instruction received at the University and it should be your pleasure, as it is your duty, to endeavor to enlist students for the Short Course of 1908. By going to young men and telling them the character of instruction given, the smallness of the expense and what the course has been worth to you, you will be able to do more good than all the circulars the University can send out. So let us, as Alumni of the University of Tennessee, take this opportunity of improving agricultural sentiment and conditions of our Southland.

L. R. N.

PERSONALS.

The Station had a short visit from Mr. J. A. Dinwiddie this month. He anticipates taking the Short Course this year.

Prof. Josiah Main will address the New Jersey State Teacher's Association at Atlantic City, Dec. 27, on "Agriculture in Secondary Schools."

Prof. J. N. Price made a short visit to Nashville about the 3rd of December to be present at a number of dairy cattle sales.

Mr. A. C. Morgan, of the Bureau of Entomology, who has charge of the tobacco investigations in Tennessee, paid a short visit to the Station this month.

Prof. S. M. Bain spent several days in Washington the latter part of November in the interest of the cotton breeding investigations that are being conducted in Tennessee and Arkansas.

Director H. A. Morgan and Prof. S. M. Bain attended the Middle Tennessee Farmers' Institute held at Nashville on the 3, 4 and 5 of this month. They made addresses before that body of farmers.

We are glad to see Mr. J. E. Converse at the Station again. He has partial charge of the Middle Tennessee co-operative work, but due to rough weather he has returned to Knoxville until the weather will permit his resuming work in that section.

Prof. F. C. Quereau, our able instructor in animal husbandry, in company with J. E. Hite and D. C. Parman, attended the International Live Stock Exposition held at Chicago during the first week in December. They report having been greatly benefited by their trip.

Prof H. A. Morgan leaves for Chicago Christmas night to address on Dec. 27 the annual meeting of the Association of Economic Entomologists of which he is president. This, as well as the numerous other branches of the American Association for the Advancement of Science, has its sessions in Chicago this year.

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BOARD OF EDITORS

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Address all communications to

U. T. FARMER, University of Tennessee, Knoxville, Tenn

THE CHILDREN.

From the New Orleans Morning-World.

For the first time since the war, Public Opinion is getting a fair chance.

Aspirants for public office have to tell what they stand for and make the people believe they stand for it.

What they stand for must be right, in the people's mind.

And the people must feel that the candidates really mean what they say and will do what they say.

Time was when certain matters, although public matters, were too sacred to be discussed on the rostrum—such matters as fat jobs, needless, but drawing big pay. To-day these jobs are vanishing targets. Time was when it was reputable to hold a useless office and draw its pay. That is to-day almost disreputable. Time was when public money was a fund for the support of political loafers. The people are now looking around to see if they can't use their money to better advantage.

The upheaval has not reached a level yet.

When it does, let us hope that one great shining rock will lift its crest, higher than all storms, above the unrest.

Let us hope that that rock will be universal and undying regard for the state's childhood—the little children to-day who are to take our places to-morrow.

A state which is concentrating its money and its power on the education and refinement and broadening of its little children—not a few of them, but all—is a superb state.

It is the governmental expression of what makes motherhood so holy and high.

It is the supremest test of civilization—the regard for little children.

It is much to be lamented that the public school and popular education has not been given the attention that is due to it.

It should take first place always.

How much can be saved the State by doing away with useless jobs and expenses is only a part of the argument.

Money is only well saved when it is well spent.

If we hoard untold millions in the State's coffers while the heads of the children who are to be the next generation, go uneducated, there could be no miser so base in all the world as we.

A State should employ the finest teachers in the world in its public schools.

It can do this only by paying for the brains.

It is the greatest economy in the world.

It will make the State in time to blossom with intellectual wealth.

The fruits will be every conceivable manner of blessing.

As the campaign waxes warmer, let the candidates take the big opportunity presented to stir up interest in public education.

Let them tell what they propose to do for public education.

That is the real sane way to get at the gambling evil.

That is the real sane way to hit at popular intemperance.

They cannot reform drunkards and gamblers. But the State can decrease the chances of its children in the future becoming drunkards or gamblers.

A word for the schools and the children, gentlemen!

THE U. T. FARMER

Vol. 2. JANUARY, 1908 No. 4

SPRING LAMB PRODUCTION IN TENNESSEE.

The spring lamb industry is an important factor in the central basin of Middle Tennessee. Not every farmer is a flock owner, nor is every flock owner devoting his entire farm to his sheep. The general plan of those who "run" sheep through the winter, for this is all one can claim for the present practice, is as follows:

Ewes. Between June 15th and July 20th, the ewes are purchased. A large per cent. of them are native, as they are called, with white faces and legs, with little or no wool growing on the belly. These natives are very prolific—a great many produce twins—good mothers and splendid suckers; with the first essential to spring lamb production, which is the early breeding habit, thereby raising a fat lamb for our earliest market. These sheep weigh from 115 to 150 pounds, usually standing high from the ground. The supply of native ewes has not been sufficient for the last few years and many Western ewes have been brought in. The majority of these importations are of Merino foundation, while the balance are usually graded with the middle wooled breeds. Farmers do not take hold of this class eagerly and reports of their value are rather conflicting. Old ewes with short mouths, when carrying good flesh, and young ewes with spoiled udders, are often brought out to the farmer from our large markets. They come to him apparently at a low cost but are costly enough when only a small per cent. of them are able to raise their lambs. This trouble is found not only among Western ewes but many natives are sold annually for the same reason. To the breeder there is nothing to say—he knows; but to the novice and some who are further along one might say, be a little more careful about "mouthing and bagging," the next time you buy. This may partially account for the almost universal poor results from this class of ewes.

Rams. A few farmers buy rams with their flocks, without any special knowledge of their breeding or fitness to produce market lambs. The sire, as they would tell you, is not of much importance after all, so why worry over him. Thus they go through the year and the next spring drive to market, half fat, rangy lambs that sell fifty cents below the market. On the other hand most men think the ram worth considering. A majority of these prefer the Southdown. Good rams of this breed carry the mutton type par excellence, are very active, ambitious and hardy to a degree, and while the smallest of the middle wooled breeds they fill admirably the requirements for early lamb production. In some localities

Hampshires and Shropshires have been used but while they have plenty of size and give the offspring a nice marking, yet they lack hardiness and are not gaining in popularity. Most of the sires with unknown parentage that are found in use over this state are either crosses or grades of the down breeds and especially of the Southdown and Shropshire. Even with a well fixed market demand, and with the different kinds of ewes in use it would seem that rams of different breeding from the ones now employed could be used with profit. At any rate, there appears to be open quite a large field for the man growing a different type of lamb —as earlier and larger, and creating his own market, thereby making it more profitable. Has not the hothouse lamb always enjoyed a good market?

Care of the Flock. During the summer the sheep are allowed the use of the stubble fields, grass lots, and any part of the farm not in cultivation. The more often the flock can be moved the better it will do. With two flocks on hand without fresh pasture it will be beneficial to occasionally interchange them. It is a common practice of some of the best lamb growers to sell both ewe and lamb and buy a new flock— knowing they do much better by changing.

After the cattle go into the feed lot in the early winter the sheep go into their pasture to find lots of grass left for them. They are thus shifted about during the winter, never eating anything of value, but counted on for a good lamb in the spring. Winter cereals are depended upon largely to bring the ewe and her lamb through in good shape. Very few farmers feed grain to the ewes during the winter but many men try to feed a little hay to supplement the pasture; pea-vine hay is especially fine for this purpose.

Lambs. The period of gestation for the ewe is 151 days. Ewes have to be bred in August to produce January lambs, at which time most producers like to have their lambs. The early breeding ewe is a big asset in early lamb production. Ewes are usually running on the permanent pasture and after lambing they are separated and turned into the wheat, oats or rye. In some ewes this stimulates the milk flow beyond the capacity of the young lamb and may give bad results. Some few lambs are fed a light grain ration of corn and bran, but mostly corn. Very seldom does cotton seed meal constitute a portion of the ration. Has it been determined that a little grain fed to young lambs will not pay? Something can surely be done to throw more light on this problem.

The January crop of lambs should be ready for the first market May 10th, weighing 70 to 80 pounds. There is yet an earlier trade, but so few lambs are ready by Easter that it is not spoken of as a regular market. The May draft gets all fat lambs over 60 pounds in weight. The next draft comes about a month later, but by this time the price is usually off from 1-4 to 1-2 of a cent more. Very large lambs are poor sellers and thin lambs are poor sellers at any size. The present market wants the fat lamb weighing between 60 and 90 pounds. Dark faces and

legs may help sell a poor bunch but the fat, prime lambs sell regardless of color marking.

Market. Louisville takes most of our lambs. Nearly all Easter lambs go farther East than Louisville. When the first lambs are ready in May, buyers come to Louisville for them. This broadens our market, makes competition greater and a shorter haul to market, thereby not only reducing drift but lessening freight rates. Buyers and sellers have become accustomed to the time each other get to market and calculate to meet, thus benefitting both parties. It is claimed the buyers will not come at any other time. Is it because Tennessee lambs get to market when no others are there or because the buyers are afraid the lambs will not be in if they come earlier? If it costs less to produce a lamb two weeks earlier, will it not be worth while for some one to tell the buyers to be around about that much sooner next year?

The **stomach worm** has been in the state many years and the majority of the flock owners have recognized its presence. Very few men know the life history of the *Haemanchus*, or how it is taken from grass by the sheep, developed in the stomach and the eggs returned to the ground, where they hatch. In about two weeks they crawl up the grass stems and await another host. Cattle, sheep and goats are hosts for the stomach worm.

Preventive. As a preventive of the stomach worm Dr. H. P. Miller, of Ohio, has used a mixture of 1 qt. of salt to a peck of tobacco; just enough salt to make the sheep eat the tobacco. Keep this before the flock but never let the allowance be large at any one time. The cheapest lug leaves are all right; chop them up fine with a sharp spade or something available. Tobacco of this kind will cost about five cents per pound.

Rotation of crops is the only economic method of combatting this enemy of our ruminants. During the summer and early fall months keep the ewes and especially lambs off of permanent pastures. It is at this season the flock sustains heaviest losses from the stomach worm. and not infrequently all the late lambs succumb when kept in an infected pasture.

A good rotation for sheep would be to have a clean meadow, clover field or rape pasture for the months of June, July, August and September. By clean, we understand as being free from infestation, and to be sure of this sheep should not have been on the land since the previous fall. From the first of October give the flock the run of the permanent pastures until lambing time, then they should go into wheat, oats, barley or rye fields whenever the land will permit. It is a good plan to have a crop of rye especially for the sheep, and allow them to graze it until plowing time in the spring. From these winter cereals move over to meadows for summer. A clover field comes in mighty well in the spring and summer.

With the above rotation it will be possible to handle more sheep and in many cases this will necessitate using some feed on the pasture. Silage is by all odds the cheapest feed we can grow; 10 tons per acre is not a large yield for a silage crop. This will cost the farmer $2 per ton and

feed 100 ewes 5 pounds per day for 40 days. For the concentrates let soy beans be grown. One acre will yield 20 bushels of grain and one ton of straw. Feeding 1-2 pound of grain per day per head, the 20 bushels will feed 100 ewes 60 days. By growing three acres of silage and two acres of soy beans enough feed can be produced to allow 100 ewes 5 pounds silage and 1-2 pound soy bean meal per day, for 120 days or 4 months, and have two tons of soy beans additional. Six tons of soy bean straw would be sufficient for 1 pound of this roughage to be added to the above ration for the entire time. The ration would then have a nutritive ration of 1-6, which is very good for breeding ewes. It would cost no more than 1 cent per day, figuring soy bean meal at its farm value of $20 per ton, soy bean straw at $3.00 per ton and silage at $2.00 per ton.

Where winter grazing is scarce and conditions are suitable it will be better to give the lambs the green stuff and the ewes the ration containing silage. A light grain ration of corn one part, soy bean meal one part, can in most cases, be fed profitably to the lambs for early market. For best results keep the ewes gaining rather than losing in flesh during the breeding season. They will get thin enough by the time they get that 80 pound lamb ready to market.

EWING HITE.

LAMBS, FERTILITY, AND CITIZENSHIP.

Mountain City, Johnson Co., Tenn., June 24, 1907.

Hon. H. A. Morgan.

My Dear Sir: I sold to-day 33 lambs out of 46 cross of Southdowns, Shropshires and Hampshires. They averaged 90 1-2 pounds per head. The thirteen ewes I selected for breeding were dropped in February and March. This is a by-product of the farm.

Capt. John Preston, of Lodi, Va., bought 393 lambs here to-day at Silver Lake; average per head 83 pounds; price paid, $1,957.14 at 6 cents. Some sold on the 10th of this month that averaged 80 pounds.

A great many of the ewe lambs are kept over this year. The farmers here have small flocks, some not more than eight and few more than twenty-five, one or two seventy-five, none 100 ewes. I think that is best as they can be shifted often on the farm and keep healthy and don't interfere with keeping other stock, especially cattle and mules.

One boy brought two lambs for sale. We are encouraging the poorer class of farmers in raising small flocks. They are but little more expensive than two or three dogs.

Mr. David Wagner had a ewe that raised three lambs; average 80 pounds; were never fed and brought $14.40. The ewes were all fed some corn until the 15th of March and some little in April. None of the lambs received any grain. All that they ate was green wheat and grass. With

larger flocks it is essential that the lambs should be fed, otherwise not.

But few lambs this year were killed. The dogs suffered more severely than usual. This district is No. 1 in the county and known as "hog and dog hell," as neither of them is allowed to run at will.

Our county is a poor, hilly county, with but little land that is fit for cultivation at all—only 5,000 acres out of 250,000. It simply makes me mad to go down the Holston valley and see the fine lands and how they have been abused—fields turned out to wash away where corn has been cultivated the year before. East Tennessee is in a worse condition to-day than when Jno. Sevier drove the Indians away. I hope you will wake them up to their duty and that the most intellectual boys will be farmers and the less day laborers and lawyers.

Your friend,

N. R. WILLS, Vice-President.

P. S. Of course we have some good people that are farmers in the Holston valley, but not near enough for the land. N. R. W.

TRUCK FARMING.

Truck farming, like every other profession, varies according to the individual and his or her opportunities.

The cabbage being about the first to commence preparing for, I will give you our method of handling it. The seed is sown anywhere from October 1st to December 15th, in ordinary cold-frames, either under glass or cloth, glass being greatly preferable. Sown at this time, the plants are ready for transplanting in January, two inches apart. Keep them in cold-frames, covered with domestic only, as light freezing does not injure the plants, provided you have given them all the open air possible, that they should not be tender. They should be set in the field from the middle of February to March 10th, the ground having been previously thoroughly plowed and bedded three and a half feet; for best results it should be bedded in the fall of the year, with 1000 to 1500 pounds of a commercial fertilizer containing 10 per cent. phosphoric acid, 5 per cent. ammonia, and 6 per cent. potash per acre. This should be put in the row and re-bedded before setting. Shallow cultivation in the field is ever for the best, and deep plowing should be avoided. Cabbage with us are usually ready for market about June 1st, the season continuing from four to six weeks. Some of our best growers, or, rather, more fortunate ones, make from four to five hundred dollars per acre, net; that is, after paying for fertilizer and box bills. Some fail to pay expenses, but I am sure the average net returns have been quite two hundred dollars per acre.

We pack our cabbage in half barrel, or what is known as the Poney, or Cairo, crate, which contains, or should contain, about sixty pounds, net, of cabbage.

The next crop that requires our attention is that of the tomato. We sow the seeds in hotbeds from February 1st to 10th; some growers using fire heat and others manure. In using either, the temperature should be kept at a range of 50 to 80 degrees for best results. Sown at this time, they should be ready to transplant about March 1st to 10th, 1 1-2 to 2 inches apart, being kept in hot-beds. About the 15th to 25th of March they are set out, in 4-inch dirt bands. You can use cold frames that you have grown cabbage in for this setting, being sure to have a good supply of straw on hands to use on frosty nights. About the 15th to the 20th of April we begin to think of transferring them to the fields. There is a great deal of rivalry among growers, as we all know the sooner we get our plants in the field the better will be the pecuniary profit; for in this case the early bird gets the juicest and fattest worm, provided, of course, we are safe from frost. Sometimes our zeal in getting our tomatoes to an early market causes us to be frostbitten—the plants, I mean—and then all the hard work of weeks and the expectancy of profit vanishes. There is a gentleman I think of, who lost two entire crops by trying for the prize of top prices by early planting in the fields, and he is a good grower, too, and when he misses the freeze, as the boys say, he lays away no little of the cheese. And I don't know but that he is right; as he is a cross-lots neighbor of mine, and just a little bit bigger man, I have never had nerve enough to tell him he was not. When the elements are kind to him and he wins out, his smile—which, literally interpreted, means "I told you so"—is prodigious. But it is taking chances. Yet the man who does not at some stage of any game take a chance or two seldom does much. The prices obtained for early tomatoes are usually double and often three times as great as those realized for late stock.

We plant about 3500 vines to the acre; drill about 600 pounds of fertilizer, containing 10 per cent phosphoric acid, 4 per cent. ammonia, and 4 per cent. of potash, in rows before setting in the field. After setting we stake each plant and keep it tied up through the growing season. This usually requires three or four applications of the string. Great care should be taken to prune or sucker often and well, so as to keep all the life possible in the plant proper, to be in turn distributed to the growing and maturing crop. Cultivation once a week is deemed sufficient; that is, if it is thoroughly done. We usually begin to look for shipping stock about June 20th, which is gathered each day as it turns of a pinkish color. The tomatoes are packed in 4-basket crates and delivered at the station, where, it is pleasing to state, we have been able to dispose of them successfully and for a cash consideration; prices varying, of course, according to market conditions and the law of supply and demand. My individual crop last season was derived from six acres of ground, which yielded 3960 crates, and netted me something over $2100. This, understand, was net, or what remained in my possession after fertilizer and box bills had been paid; or a fraction over fifty cents a crate. This was about an average yield last year. Some of the growers did better than this, while some

failed to pay expenses; but you will find this the case every season, everywhere.

The strawberry should and does come in for a share of our attention. This toothsome and healthful fruit is set out in the spring, from 4000 to 6000 plants per acre. Its cultivation is about the same as that for cotton and corn; that is, if you keep the grass out you have cultivated them enough. We use the matted-row system. My crop of eight acres last season yielded 600 crates and netted me $714. This represents what I had in my jeans, after paying for picking and box material, out of the gross sales. Some of our growers realized more than this, and again some not so much. We grow the Klondyke, Crescent and Lady Thompson varieties mostly and sell f. o. b. station, just as we do cabbage and tomatoes. There are other small vegetables, such as sweet pepper, cukes, cantaloupes, beans, and peas, that usually pay well.

There were, according to railroad statistics, shipped during the season of 1907, from Humboldt station, about 600 cars of fruits and vegetables of various kinds. The heaviest shipment any one day was 48 cars. This was of tomatoes, and the largest single day's output in the history of truck growing in West Tennessee. We believe, everything being equal, this vast amount will be exceeded this year in the entire season's output by quite 40 per cent, and it may be that some one day bills of lading for 75 cars in one twenty-four hour's time will be issued. With the increased acreage promised, this is not at all unlikely.

Humboldt, Tenn. J. S. STALLINGS.

TOBACCO INSECTS.

The tobacco crop, like all our cultivated crops, has its quota of insect enemies. They make their appearance as soon as the young plants appear in the seed bed and continue their depredations oftentimes until the manufactured product is consumed. However, many of these pests are of such slight importance in Tennessee that they will give place in this paper to a discussion of those species of immediate importance to the Tennessee growers.

The unprecedented injury to seed beds by the flea beetle, *Epitrix parvula*, during the spring of 1907, was due largely to the cool, late spring. The temperature was not high enough to drive the beetles out of the beds. Total destruction resulted in a large percentage of the beds, and many had to be resowed the second time; as a result the crop was reduced twenty to twenty-five per cent. All this injury could have been avoided by covering the beds properly with good canvas. Even after the damage had begun it would have been an easy matter to check it by spraying the young plants with Paris green at the rate of 1 pound to 150 gallons of water. It is better, however, to rely upon the ounce of prevention, that is, the proper canvasing of the beds and have the Paris green on hand for an emergency, rather than to be put to the necessity of resowing the beds.

Cut-worms, grasshoppers, tree crickets, stink bugs, bud worms and some other insects do more or less damage every year, but it is not to be compared with that done by the Northern tobacco worm, *Phlegethontius quinquemaculata*, and the Southern tobacco worm, *Phlegethontiu s sexta*. These worms are present every year and against them the grower must wage a relentless war if he would save his crop from destruction.

Since the life histories and seasonal histories of the two tobacco worms are so nearly identical, and since the remedial measures that apply to one apply equally well to the other, no separate treatment of the species will be attempted here, although the observations recorded were made upon the Southern species.

The Southern tobacco worms pass the winter in the ground in the pupal state, in which condition they are entirely at the mercy of the grower. The larvae—worms—enter the ground in the fall, and, at a depth of three to six inches, smooth out cells in which they transform to pupae. In this stage they are incapable of locomotion and require the protection of their earthern cells. If the land were plowed to a depth of six inches late in the fall or early in the winter, the cells would be broken open and the pupae would be thrown out. Thus exposed certain death would result. Half the labor of worming the next tobacco crop would be done if all tobacco stubble were treated in this way.

Neither should growers defer their direct campaign against the worms until they threaten to destroy the crop. Each female moth that emerges in the spring will lay 200 eggs, which will hatch and finally mature moths, each female of which will lay 200 eggs for the July and August infestation. At least one-half the moths will be females. Then 100 females is the result of the eggs laid by one female in the spring. The August product of worms from one female emerging early in the spring will be 100 times 200, or 20,000 worms; enough to infest one acre of tobacco with six worms to every plant. Therefore, by all means possible, make war on the early moths and worms. Poison "jimson" blooms with cobalt, kill all the early worms either by hand-picking or by applying a light dusting of Paris green and air-slacked lime at the rate of 1 to 4, for, every moth or worm killed early in the season divides the number to be killed in July and August by one to two hundred.

A. C. MORGAN, Short Course '08.

AGRICULTURAL EDUCATION.

A Plot System for Tennessee Schools.

Coordinate with the class-room and laboratory is the system of demonstration plots in which agricultural theories may be tested, agricultural principles demonstrated, and the best practices illustrated for the benefit of the class and of the community. The system that will be de-

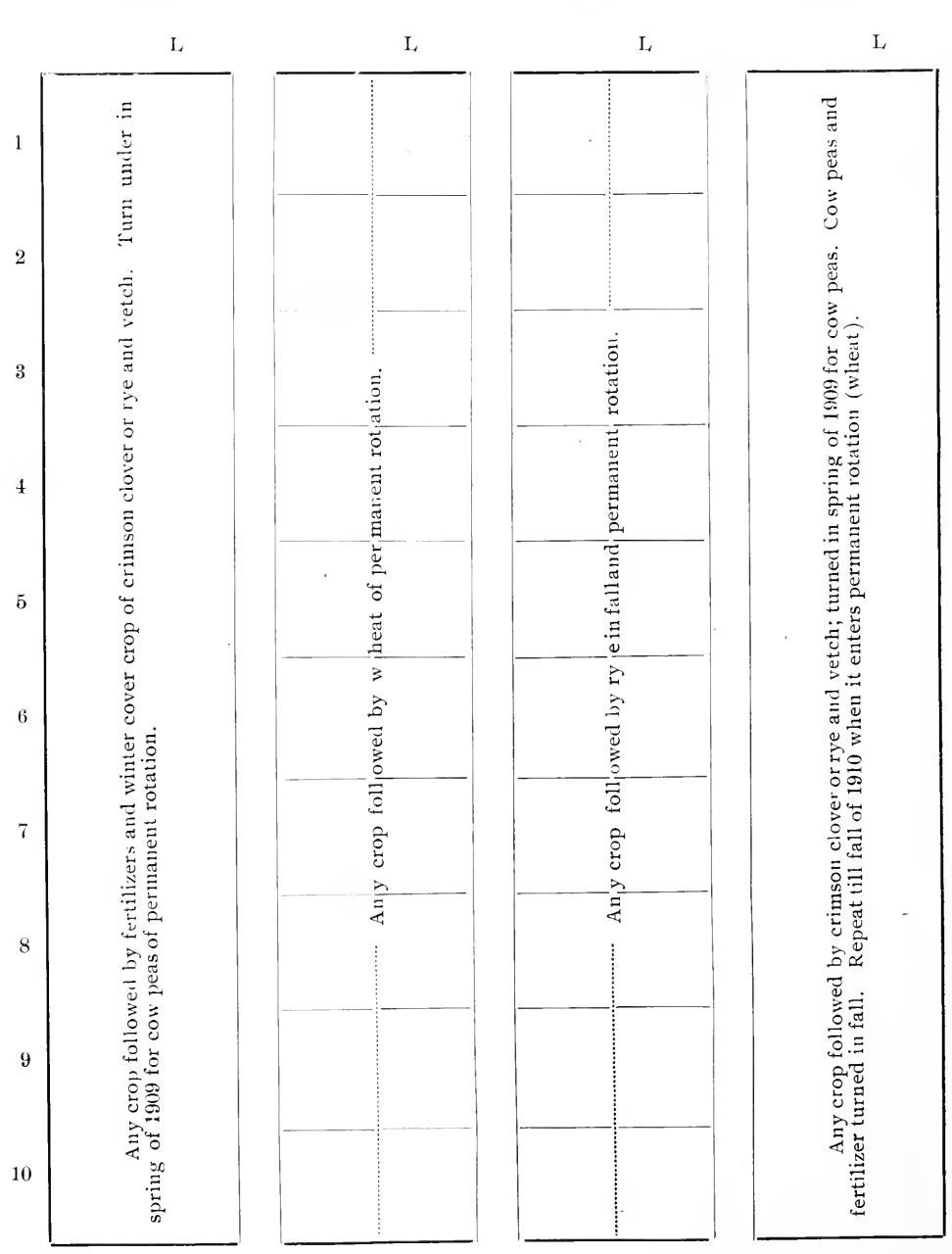
scribed is one that conforms to the system of extension plots now maintained at various places in Tennessee by the Agricultural Experiment Station. It has been worked out with some care and is intended to so unify the work as to make results of widely separate schools comparable and render it possible to advise by correspondence with teachers having charge of this work in various parts of the state. The plan is also thought to be sufficiently comprehensive in the variety of demonstrations offered to cover the most important principles and factors of crop production.

This plot system has been adopted by one agricultural high school of the State and will be established at another soon. It requires about four acres of arable land so located and protected as to be free from trespass. The plots may be so adjusted as to fit limited areas.

In outlining specifically this system of plots and crops it is realized that we do so at some risk. But it should be understood that the plan is not iron clad and that we shall find it necessary to adjust it to local conditions, to lessons which experience shall teach, and to agricultural progress. Such changes are to be expected. But teachers need, and have a right to expect specific directions and the accompanying plans are believed worthy of respect. The school which tests them and proves them faulty will be far ahead of the school that waits for a faultless system. What could be more interesting and profitable than for a State convention of agricultural teachers to discuss the system after a five years' trial?

The University encourages high schools to undertake these demonstrations and will furnish a man of experience to lay out the plots to suit the area and the soil, where there is such a local sentiment as to indicate a probability of the plan being given a fair trial and where there is a teacher who is, or may be expected to develop into an active apostle of progressive agriculture. But we would not advise any school to make the beginning who has not carefully considered the cost. Mere enthusiasm, though indispensible, is not sufficient. Like *liberty*, the price of *success in modern husbandry* is eternal vigilance. This implies greater expense in (1) securing the land; (2) insuring the teacher a more permanent tenure in his job; and (3) providing the best of prompt and intelligent care for the plots during the summer vacation. The school that cannot afford these prerequisites should not undertake this work. Any county high school or any school accredited to this university which can give some assurance of these prerequisites will command the services of this university. Such services include laying out of the plots agreeable to a plan uniform for the entire State; advice by correspondence with this department and with the Experiment Station; occasional personal inspection; a system of recording results on blank forms furnished by this department; and the dissemination of results through the U. T. Farmer and by conference of teachers.

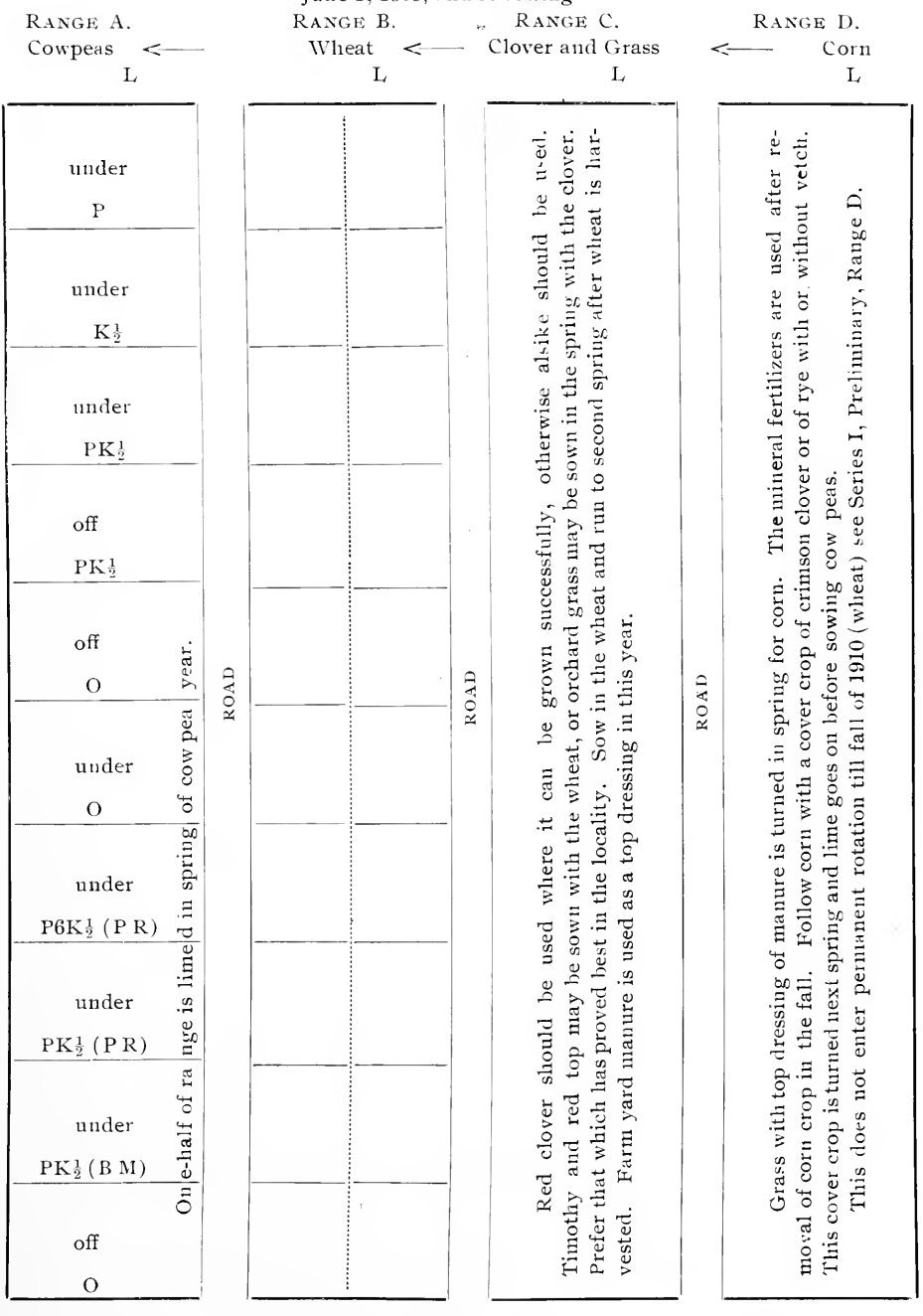
SERIES I. ROTATION [PRELIMINARY.]
June 1, 1908.



EXPLANATION: Size of plots, 36′x60.5′ one-twentieth acre with 2′ paths between.
Size of Ranges 378′x60.5′ with 15′ road between. Half of each range has L applied once in rotation 4 years.
Fertilizers are applied once in rotation (4 yrs.)
Corn omitted from rotation till 1910 (Range C).
Rotation may be lengthened a year in farm practice by letting grass remain a year longer.

SERIES I. ROTATION [PERMANENT.]

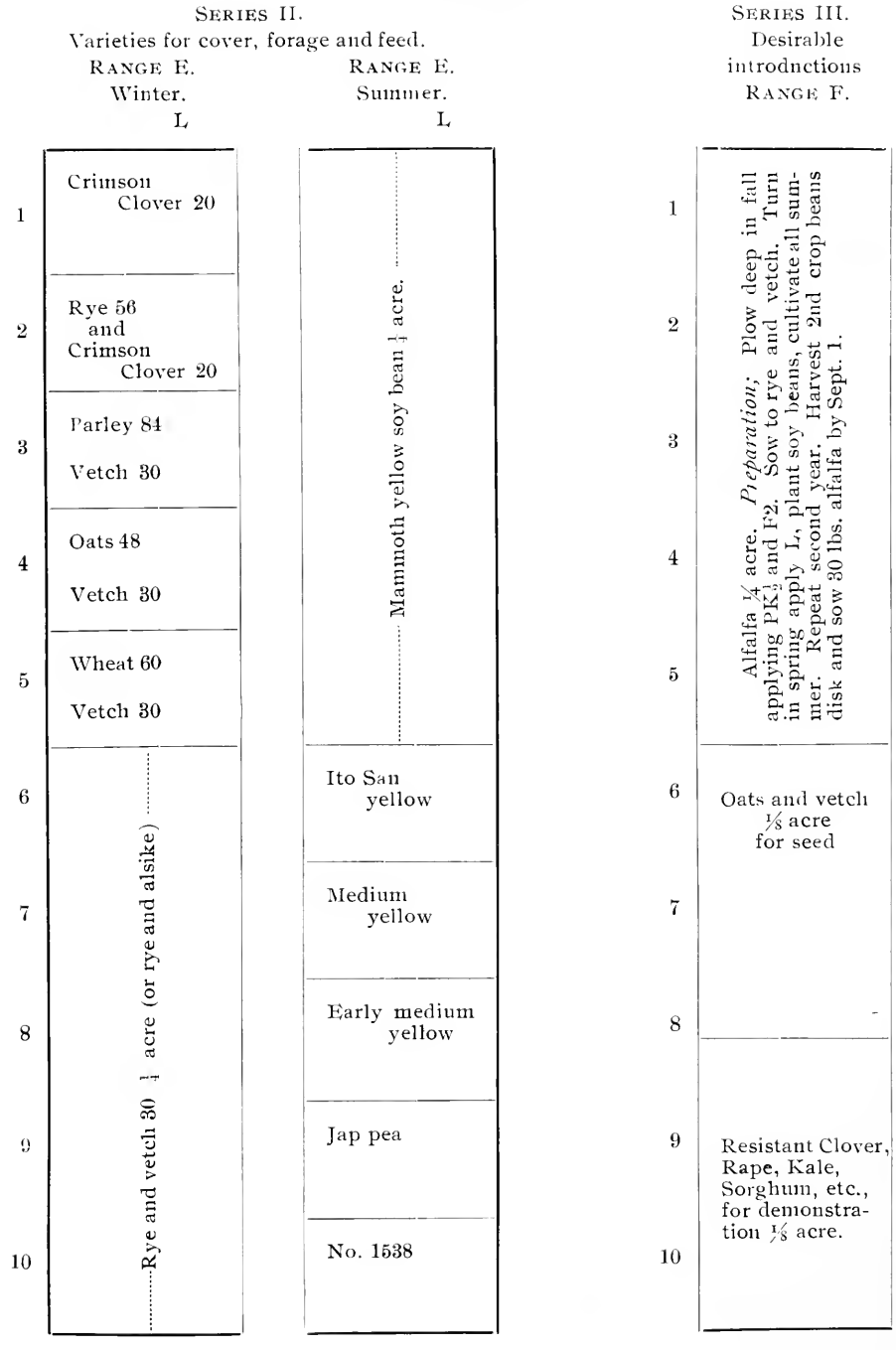
June 1, 1909, and following



EXPLANATION: P=300 lbs. high grade acid phosphate per acre having 16% P2 O5. P2=twice above amount; P6 six times, etc. P (PR)=150 lbs. per acre ground rock phosphate. P (BM)=200 lbs. per acre steamed bone meal 24% P2 O5. K=100 lbs. muriate of potash per acre 50% K2 O. F=6 tons farm yard manure per acre. L=2000 lbs. lime per acre.

"Off" and "under" indicate whether cowpea crop is to be harvested or turned under as green manure.

Plot and lime lines apply to all ranges, as shown in Range B. Crowded out only to insert printed instructions.



EXPLANATION: Size of plots $\frac{1}{20}$ acre 36′x60.5′ with 2′ paths.
Range E given PK½ in fall and L on half in spring. Winter crop turned. Summer crop harvested for feeding test. Lbs. to sow per acre indicated for winter crop. Summer crop of varieties of soy beans sown in 30″ rows for cultivation.

EDITORIALS

For the benefit of both readers and advertisers it should be understood that we have no advertisers that we cannot recommend, and will have none. And we have no department in which advertisers may get special attention called to their ads. To do so would increase the work of editing and giving to each his quota of attention, would alter somewhat the simple character of this publication and be of doubtful benefit to our advertisers as a whole.

The Farmer acknowledges receipt of a copy of "Agriculture, Its Fundamental Principles," by Pres. Andrew M. Soule of Georgia State College, and Edna Lee Turpin. In preparing an elementary text in agriculture the authors are getting into a field that is being rapidly filled with texts of varying degrees of merit and their task in justifying the presence of a new rival for popularity is correspondingly difficult. We have made no exhaustive attempt to test the accuracy of its science nor the correctness of its agricultural practices, which are of first importance in every agricultural text, but Pres. Soule's many friends and acquaintances in Tennessee know from experience that he is to be trusted to present the art and science of agriculture correctly for Southern farmers. It is by far the best text we have seen for Southern schools in its Southern setting. And it is lifted somewhat above the rivalry of a large majority of texts by being addressed to a more mature class of students than are they. It might have been lifted into the high school class by a more technical development of those portions relating to fertilizers and to feeds and feeding, but that evidently was not its purpose. The book is profuse in its illustrations and contains a vast amount of information for its class; is fairly well done mechanically, and low in price. (B. F. Johnson Pub. Co., Richmond, 1907. Cloth, 320 pp. 75c.)

A farmers' institute for the Short Course students held at the University on Jan. 17, at which Commissioner of Agriculture Thompson and Live Stock Commissioner Dunn were heard in short addresses, was made the occasion for a conference with the county vice- presidents regarding the date and program of the Eastern Tennessee Farmers' Convention to be held this spring. A series of county institutes was also planned under the auspices of the State Agricultural Department.

Among the other speakers before the institute were State Supt. of Schools, R. L. Jones; Mr. Henry Clark of Wartrace, an experienced mule raiser; Mr. G. C. Bingham, of Bell Buckle, a cattle feeder; Mr. J. S. Stallings, of Humboldt, whose paper appears in this issue of The Farmer, and various members of the agricultural faculty.

At the twenty-first annual meeting of the Tennessee Public School Officers' Association, held in the Senate chamber at Nashville, Jan. 21, 22, and 23, Dr. Ayres and Prof. P. P. Claxton, of the University, were heard in short addresses. County Supt. Fred B. Frazier of Rhea county, a good friend of agricultural education, was elected president for the ensuing year.

PERSONALS

At the annual meeting of the Tennessee State Nurserymen's Association, held recently at Nashville, Prof. G. M. Bentley of the Agricultural College, was re-elected secretary.

Christmas has come and gone and the problems of 1908 are now confronting us. During the holidays, Professors Morgan and Bentley went to Chicago in the interest of scientific meetings which were held in that city.

A great many students of the different departments spent their holidays at their homes.

Mr. Cotton spent his holidays at his home in Ohio. He also paid Chicago a visit, while gone.

As was expected, the examination very perceptibly thinned our ranks, but the agricultural department is still doing business at the old stand.

Although the money panic seems to have had quite an influence in certain industries it hasn't affected progress in the erection of our new agricultural building.

Quite a number of the Short Course men have arrived and others are expected as different branches of work are taken up. They are welcome on our hill, and every door is left open to them.

Our dean, Cooper D. Schmitt, is untiring in his efforts to impress upon the students the necessity of lessening the daily absences and every loyal and honest student should aid him in his cause.

In response to a call of the president of the Agricultural club, a large number of the students, Short Course men, and faculty gathered in Morrill Hall Wednesday evening, the 8th. Two interesting talks concerning the recent international stock show, were made by Parman and Hite, respectively. Mr. Cotton also gave some information in regard to the packing system and government inspection now used in the large packing establishments.

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U. T. FARMER, University of Tennessee, Knoxville, Tenn.

IS THERE A SCIENCE OF AGRICULTURE?

Dr. E. W. Allen (Editor) in Experiment Station Record (Jan., 1908), U. S. Department of Agriculture.

A thorough grounding in the natural sciences is essential to thorough agricultural courses, but so long as the instruction is confined to the departments of pure science it has had, and will have, very little significance or importance to agriculture. The teaching of the sciences in their relation and applications to agriculture requires a broad outlook and a special point of view which the teacher of general science rarely, if ever, possesses. It requires sympathetic relations with the various natural sciences, as well as with the practice of agriculture, for the problems are so complicated that they overstep the boundaries of any single primary science.

If the divisions of science were strictly adhered to we should have no such thing as agricultural science, no systematic attempt to bring together and classify scientific knowledge in its relations to agriculture and no scientific basis for agricultural instruction.

The classification of agriculture is no easy task, but it is not to be accomplished by reverting to the basis of the primary sciences. This much we have learned from the experience of the past. Any system which refers the instruction in agriculture to the departments of pure science, even with agricultural specialists in those departments, will fail of efficiency on account of the restricted scope and the special view point imposed by the individual departments. The facts of pure science and the conditions of agricultural practice must be brought together and harmonized.

The present day plan for the classification of agricultural knowledge and its formulation into courses of instruction has cut loose entirely from the old academic idea. It is based on the application of this knowledge in the natural divisions of agriculture, rather than on its scientific origin. In a large measure it obliterates for its purpose the boundary lines of pure science. This seems to be a fairly logical and workable basis for the arrangement of teaching courses, and a proposal to return to the former basis of the primary sciences would find scant indorsement among men who have studied the pedagogics of agriculture.

THE U. T. FARMER

Vol. 2. FEBRUARY, 1908 No. 5

SOILS AND FERTILITY.

THE PRESENT ATTITUDE OF THE BUREAU OF SOILS.

A series of three lectures given at the University of Tennessee, Jan. 14 and 15, 1908, by Dr. Frank K. Cameron, of the Bureau of Soils, U. S. Department of Agriculture.

[NOTE. The methods of the Bureau of Soils in soil investigation and their theory of fertility have been the subject of some discussion and disagreement on the part of various state agricultural experiment station investigators. The opportunity to get the Bureau's attitude first hand, in a brief form, and up-to-date, was most fortunate. The notes accompanying these lectures are inserted in order to show where some of these issues lie and are in nowise to be taken as presenting the whole argument of the Bureau's opponents. Copy of these lectures was sent Dr. Cameron for correction and is here printed as returned. ED.]

I. Soil Physics.

The fact that three-fifths to four-fifths of the total of commercial fertilizers used in the United States are used in the Southern states makes the subject of fertilizers of immense importance to us here, and warrants a careful consideration of the means of controlling and conserving soil fertility. Among these means are methods of cultivation, rotation and direct application of fertilizers. It is a common belief that the use of fertilizers obviates any necessity for considering the other two; that "you won't have to work" if you only know what fertilizer to apply and how to use it. This idea is and always will be erroneous.

Naturally, a consideration of cultivation methods comes first. To properly manage a soil requires and develops as much skill as the pursuit of any other business or science. It calls for the same carefully trained observation and inductive reasoning as other callings, and its mistakes are perhaps more fatal to success than in most others.

Classification of soils. Soils have been classified in several different ways. The most obvious difference between soils is that of color, and this is of some value, but of limited application. It is true, as a rule, that black soils are more fertile than red, and red than yellow or gray. But no scientist has yet found this an adequate basis for a systematic classification.

Again, soils are sometimes classed according to their geological origin. While it is true that the mineral elements of a soil are all found in the parent rock, and of the parent rock, all are found in the soil derived from it, and the character of a soil is thus determined largely by the character of the rock from which it originated; yet, the quality of the soil is a result much more of chemical decomposition, than of mere

physical disintegration of the parent rock. The value of the geological classification is limited by the degree to which soils of the same geological origin decompose under different external conditions. Also the fact that most of our soils have been transported by streams, glaciers, and winds, often wipes out knowledge of the origin; and materials of widely different origins are mixed so as to make a geological classification of such soils impossible.

An agronomic classification of soils has been used, as wheat soils, potato soils, tobacco soils, etc., but it has been found that a typical wheat soil, for instance, of Oregon differs entirely from a wheat soil of Tennessee in color, origin, and texture, and that plants generally do not observe such distinctions over more than local areas. This classification is therefore inadequate and inaccurate for general use.

Classification used by the Bureau of Soils. The classification based upon physical texture is one adopted by the United States Bureau of Soils, and it is on this that soil areas are mapped. This has proven best adapted for all purposes. Pursuing this system the Bureau of Soils has distinguished and secured samples of about 456 types of soils, with variations and intermediate types, sometimes found on limited areas. The selection of these types is somewhat arbitrary, and the list is subject to revision, but additions to or subtractions from the list grow less frequent as the investigations continue. These types are therefore of such number and individually of such distinct character as to be well within the comprehension of the investigator. They vary all the way through the series from clay, clay loam, loam, sandy loam, to sand at the other extreme. Conforming to this classification the United States is divided into soil provinces which fit, more or less accurately, the well-known great physiographic regions. In fact, discrepancies between the two systems are not much more numerous than disagreements between physiographers themselves, as illustrated by their failure to agree upon the exact limit northward of the Piedmont belt. This limit of a particular type of soil to its physiographic region is of such certainty that we never find a Piedmont soil in the adjacent Coastal plain, nor *vice versa;* and a glacial soil is limited to a glaciated area. This fact is of such general application as to be observed by business men, insurance companies, and railroads in matters in which soil questions may be involved.

Each type of soil has an individuality. Texture determines moisture holding capacity, and this, with color, largely determines temperature; temperature and drainage in turn determine distribution of crops. Chemistry of soil may determine the vigor of the plant and the yield of the crop, but has less effect in a general way of influencing the geographical area devoted to it.

Soil temperature. The sun warms the soil from the surface downward. As the days grow warmer in early summer the subsoil is always colder than the surface soil. It is sometime after midsummer when the

surface has begun to cool that they are of the same temperature, and from that point to midwinter the surface cools more rapidly than the subsoil. This constant lagging behind of the subsoil is known as *hysteresis*, and the growth of plant roots in surface and subsoil is affected by this fact—roots feeding near the surface in early summer and feeding more in the subsoil during early winter. The effect of hysteresis is more marked when the surface soil is dark, since dark soils take and give heat more readily than do light ones.

Soil moisture. The movement of moisture into and out of a soil involves some very interesting and hitherto unfamiliar physical principles. For instance, rainfall on a dry soil evolves heat sufficient to raise their combined temperatures sometimes as much as six or eight degrees Fahrenheit. The oppressive heat sometimes noticed after a summer shower on loose soil can be felt with the hand, or perceived by the rise of steam from the earth—a familiar phenomenon. English physicists have done some investigating on the effect of wetting dry powders, and this force in the soil, as estimated by Lord Kelvin, may be as much as 30,000 atmospheres, or 450,000 lbs. per square inch—something fearful to consider if it could be harnessed or directed.

Equally great must be the force necessary to get the moisture out of a soil, but there is no known mechanical method by which it may be done rapidly on a large scale. It requires an extremely powerful centrifuge to extract a normal soil solution; hence, we have few such manifestations of energy as in the wetting of soils.

Film water is held by enormous force. If a dry soil, low in water content, be in contact with a soil wet to any degree below the optimum there will be no interchange of moisture, but if the latter have more than the optimum there will be a rapid movement. Thus if there be a dry surface soil above a wet one the movement upward does not become more, but less rapid as the soil above dries. Gravitational water, on the other hand, runs down and out of the soil, carrying minerals in solution. An upward movement of water occurs when the surface soil becomes dry.

Relation of plants to soil moisture and texture. In the relation of the plant to the moisture content of the soil two important moisture points are to be noted. The wilting point is that at which the moisture content is just insufficient for sustenance of the plant. Different as various plants are in other respects, it is not true, as formerly believed, that each plant has its own peculiar wilting point. Investigation shows this point to be about the same for all plants with a given soil. Different soils, however, vary greatly in the percentage of moisture at which plants wilt in them. The wilting point is therefore said to be a function of the soil, and not of the plant. Increasing the moisture content from the wilting point we reach, after a while, the optimum content or that most favorable to plant nutrition. This, like the wilting point, is a function not of the plant but the soil, and varies with different soils. At the optimum moisture point all physical properties of the soil are most favorable.

Below this point practically all the moisture content is film water around the soil particles—the form in which the plant may use it. Above the optimum point the physical properties of the soil change to the disadvantage of the plant, which thrives better below than above the optimum. Between the optimum and the saturation point the water in excess of the optimum content is known as gravitational water.

Since the soil is the home of the plant, the former must permit the movements which every living plant makes. A plant that cannot move—both root and top—dies. The movement of roots is mainly by addition to the tissues of its extremities. These tips of roots, though delicate in structure, have a total force of absorption and of motion that is enormous. The food is taken in near the tip, back of which the older portion becomes covered with a deposit of cork.

Movement of soils. The physical properties of a soil more than the chemical properties determine the adaptation of crops. The importance of the chemical composition of a soil has been greatly overestimated.

We have heard much said of the loss of plant food from American soils by our large shipment of farm products to Europe. Yet this loss is very little compared with the annual loss of soil by erosion. The Tennessee river carries by us untold wealth in the form of our richest soil—a loss which by concerted intelligent action could nearly all be prevented. The Mississippi river carries $2,000,000,000 of plant food to the gulf annually. It is the problem of the immediate future to stop this wholesale erosion. Another important factor in the preservation of our soils is the power of winds to transport soil particles. This is enormous, little appreciated, and, like erosion, readily controlled.

Soils are not standing still, as generally thought, but are moving all the time, due to successive shrinkage and expansion as a result of successive wetting and drying. Drying back to the original moisture-content after a wetting does not result in the original volume, but in a diminution of it. This shrinkage is much more pronounced in a cultivated field, and makes cultivation the more necessary.

The cracking and consequent drying out of soils is another important matter of soil physics, but is not an unmixed evil. These cracks, going as much as twelve or fourteen feet deep, permit an interchange and mixture of the upper with the lower strata of soil by filling at the bottom with soil particles loosened at the top. This interchange has maintained profitable yields of the same crop continuously for 2,000 years on soils of India. The general movement and mixing of soils due to alternate expansion and contraction of soils resulting from alternations between wet and dry, and between frost and heat, tends to keep soils of uniform texture and renews the surface fertility from the subsoil. The magnitude of this movement is shown in the disposition of soils of cultivated fields to pile up against the upper side of a stone fence in a way familiar to all. Of the other agencies affecting this interchange and mixing, the work of man and the burrowing animals and insects are very important. But none of them

are to be compared with the work of the common earthworm, by whose activity Darwin has estimated that ten tons of soil are annually brought to the surface on each acre on certain areas in England.

With these facts in mind, the method of certain scientists recently to limit consideration of fertility to the first seven inches of the soil, and to consider the removal of crops as a subtraction of the fertility from this limited portion, must be regarded as sheer nonsense.

Contents of the soil. Soil consists of mineral matter, organic matter, and a water solution containing soluble portions of the mineral and organic materials. It contains air which differs from atmospheric air in having less oxygen, and more nitrogen and carbon dioxide than the latter. The mineral portions of the soil consist mainly of rock debris—silica, alumina, and ferric oxide—derived from the parent rock, but the impossibility of correlating soils with the underlying rocks is discussed elsewhere. The organic matter contains, besides the decomposing plants and animals, the excretions of living plant roots, toxic or otherwise.

II. Soil Chemistry.

History of fertility investigations. Early in the 19th century the work of Liebig and a school of investigators of different nations first demonstrated the necessity of minerals as food for plants. From this work grew the Liebig theory that failure of crops is due to lack of minerals, and that they can be supplied the soil for the use of crops. There have followed three methods of soil investigation (chemical), the later supplementing while partly replacing the earlier, and all in use to a greater or less extent to-day. They will be mentioned in historical order.

First method: This method is based on the assumption that, since plants required certain minerals in somewhat constant proportions for their food, the fertility of a soil might be judged from the total amount of such elements the chemist might be able to extract from the soil. As now practiced, the Official Method requires that the soil be heated ten hours in concentrated hydrochloric acid at the boiling point of water, and the minerals of fertility estimated by the usual chemical methods from the resulting solution. It has always been recognized that neither this method nor any other known to chemists can extract all the fertilizing minerals, but the ratio of soluble to insoluble content was taken to be a constant for each mineral, and the total of each computed from the analysis by use of such constant.

The inadequacy of this method is apparent. Plants have no such powerful reagents by which to extract their food, and the proportion of the whole that may be available to them for the immediate growth cannot be determined by this method. Confusion is added to inadequacy by the variety of modifications which this method undergoes at the hands of different investigators. Dr. Peters uses dilute acid; Dr. Maxwell uses aspartic instead of hydrochloric acid; some English investigators use citric acid; French use nitric acid; Italians use calcium chloride, and in

Bohemia a solution of many reagents is used. But, with all this confusion, the method must be treated with some respect. There is some merit in each of its modifications.

Second method: On the assumption that the plant contained minerals in the proportion that they should be provided in its food, plant ash is examined chemically and its contents taken as the proportions to prescribe in the food. The error of this assumption is due partly to the fact that no two successive crops from the same soil analyze the same, and *a poor crop actually takes out more minerals than a good one.*

Third method: The third method is to ask the living plant itself by offering it food in pots or plots in various proportions and combinations and noting that on which it thrives best. The method by plots has serious drawbacks, due to the fact that seasonal differences have as much to do with crop yields as do fertilizers. In a favorable season, Director Thorne, of Ohio, got 56 bushels of wheat on his check plot (untreated), which is more than his fertilized plots yielded. Also, successive cropping may so change the character of a plot in ten years as to make a comparison of the first and last results valueless.

Some hitherto unrecognized principles. Water as a solvent. In its investigations the Bureau of Soils decided to abandon analytic for synthetic methods. These methods are based on some hitherto unrecognized chemical principles, which are involved in the experiments described later.

By the chemist all substances are known to be soluble in water. Even glass is so dissolved, but to such slight degree as to be negligible for ordinary purposes. But where geological ages are involved even the hardest rocks yield to the solvent action of water and disintegrate, forming soils. Water is the best solvent known, but is not generally so recognized, and its solvent activity is commonly attributed to such salts or reagents in solution as natural waters always have. As an example of this we attribute the formation of clays from their parent rocks, the felspars, to the carbon dioxide which ground water carries in solution. As a matter of fact the carbon dioxide is only indirectly concerned in the work, as shown in the *kaolinization* of a felspar as follows:

$$\underset{\text{orthoclase felspar}}{KAlSi_3O_8} + HOH = KOH + HAlSi_3O_8.$$

Being a reversible reaction further dissolution will cease if the potash (KOH) be allowed to accumulate. But if carbon dioxide (CO_2) be present we will have the following reaction:

$$KOH + CO_2 = KHCO_3,$$

and this neutralization of the KOH permits a continuation of the solution of the felspar. Kaolinization is completed as follows:

$$4HAlSi_3O_8 + 2H_2O = \underset{\text{pure clay}}{Al_4(SiO_4)_3} + 4H_2O + 9SiO_2,$$

the SiO_2 being partly soluble and partly insoluble (sand). It is thus seen that carbon dioxide has no further work after reacting with the potassium hydroxid. Similarly water is the active agent in the solution of limestone and other carbonates.

Difficulty of securing a representative soil solution. In general we may say that the presence of one soluble substance in soil water does not necessarily affect the amount of others in the same solution. All soil solutions have all minerals dissolved in them. But what their amounts and proportions are in the solution of a soil below the optimum water content, is a matter extremely hard to determine. Leaching such soil necessarily puts it above the optimum, and the gravitational water obtained may not be comparable to the film water, the form which the plant uses, in its proportion of the various minerals. The reason for this lies in the adsorptive power of the soil, which may exhibit a preference for one material over another.

Omitting as impracticable any method of getting a solution from beneath a growing crop, the investigators at last found a method by which, with a powerful centrifuge, a soil not above its optimum in moisture content was made to yield a solution that was considered comparable to that which the plant uses, and this solution was tested chemically as well as by its effect on the growing seedlings. Soils from New Jersey, Maryland, Virginia and North Carolina, which had grown wheat, were the ones generally used. Productive and unproductive soils of the same type, and selected from localities as nearly adjacent as possible, were secured in each case.

Adsorption. In order to understand the control of soluble salts by a soil, and to show the error in methods of testing soil practiced by some investigators, what may seem a digression must here be made. And first, we must distinguish three kinds of absorption, as follows: *Imbibition* is the taking of a liquid into the pores of a solid as a sponge takes water. *Absorption* proper applies to the absorption of gases by solids or liquids. *Adsorption* is the condensation on its surface of gases or liquids by a solid. The familiar use of boneblack to absorb odors and purify waters is an example of the last.

Adsorption is selective, alkaline ions being generally preferred to acid ions. Adsorption being a condensation on the surface of a solid, is increased with the increase of surface and the comminution or grinding of large particles into smaller ones, whereby the total surface may be greatly increased, affects adsorption proportionally. The ions composing a salt, being free to move when in solution, may be separated when brought into contact with any insoluble powder, the bases being more readily adsorbed, leaving the solution acid in reaction. Litmus, which is an organic salt as well as an indicator of acidity and alkalinity, like other soluble salts, is separated into its ions by solution, being blue in color. Where adsorption of the base occurs, as it will in contact with any finely divided substance (as soil or boneblack), the solution of litmus reacts acid and becomes red. Other indicators, such as phenolphthalein and methyl orange, behave similarly in distilled water to which boneblack is added. Distilled water in a glass beaker gave a neutral test, but when the beaker was crushed and pulverized in a mortar, the solution into which it

was poured gave a very decided alkaline test. Similarly, a whole series of soil-forming rock powders, including several granites, felspars and apatite, responded alkaline. A drop of litmus on a blotting paper gave the familiar concentric rings, the outer one being pure water unaffected by adsorption, the center being blue because of the readily adsorbed alkali at that place, and between the two a red ring marked the region to which the acids had penetrated before being adsorbed. Because of its adsorptive capacity, cotton completely filtered out various dyes and indicators from solution, though the filtrate reacted acid to the indicator just as it did before filtration.

The formation of a precipitate by reaction of two soluble salts may cause a solution to become acid by adsorption of the base of the soluble salt, as in the following:

$$\underset{\text{neutral}}{BaCl_2} + \underset{\text{neutral}}{Na_2SO} = \underset{\text{neutral}}{\underline{BaSO_4}} + \underset{\text{acid}}{2NaCl}.$$

Similarly alkaline solutions may be caused to give acid reactions. In the electrolysis of a rock solution the acid goes to the anode, and the base to the kathode carrying the water with it through the porous partition intervening. The accumulation of this liquid at the kathode resulted in an overflow through a siphon, and the liquid thus caught was markedly alkaline in reaction.

Selective adsorption by soils. Soils have enormous adsorptive power. This power is great enough to break up salts by the adsorption of bases. This is shown in the case of sodium nitrate, which yields nitric acid as follows:

$$\underset{\text{neutral}}{NaNO_3} + \underset{\text{neutral}}{H_2O} = \underset{\text{basic}}{NaOH} + \underset{\text{acid}}{HNO_3},$$

the acid being permitted to go through the soil in the soil solution with less hindrance. It should be evident that the litmus test is not a fair test of acidity of the soil, as the soil may retain the base (alkali), and the paper get what is left, which is apt to be acid by test. In fact, *a vast majority of our soils are alkaline in fact, though acid by test.*

This adsorptive character of soils affects the soil solution in other ways. It makes impossible a comparison of the soil solution, which the plant feeds on—including adsorbed materials—to spring water, which is gravitational water. It causes the retention and accumulation in the surface soil of useless rock material which comes up by capillarity along with plant food from the subsoil, such accumulations being unaffected by leaching beyond a definite limit. It causes the retention of toxins secreted by plants, and helps explain why different water solutions from "poor" and "good" soils, showing the same amounts of nitrogen, phosphorus, and potassium, caused unequal growth. It accounts for the value of lime often as a purely adsorptive agent.

Selective adsorption explains the futility of trying to solve soil problems by pure chemistry, and drives us to the position which we have formerly held, and from which we should never have wandered; namely, that there is no science of agriculture, but a number of sciences on which

it is based, and which may contribute to it. Agriculture is not a science, but an art, and whether the farmer is to be an artist or an artisan depends upon his intelligence and effort.

III. Soil Physiology.

Cause of infertility. It is a long recognized fact that plants can take their mineral food only in the form of a solution. This soil solution consists of the soluble elements, compounds, and especially salts, and is more or less nearly in a state of equilibrium as regards its chemical composition and degree of concentration. All soil solutions tend toward this normal solution, though none attain it exactly. Therefore *the thing which makes a soil rich or poor is a soluble substance and can be examined as such.*

In its investigations with soil solutions the Bureau of Soils found that a solution of the mineral plant food from an infertile soil becomes more fertile as diluted. This leads to the conclusion that it is not the absence of food, but the presence of poisons—toxins—that makes the infertile soil unproductive. This harmful substance is organic and not easily handled in the soil, though easily handled in the laboratory. The farmer's means of control are by cultivation, crop rotation, and the use of fertilizers.

It is easy to look for inorganic substances. It is easy to discover the ions of a solution, though it is impossible to identify a mixture of several salts in solution. We do not know how the ions combine. We do not know whether K is taken by plants as K, KCl, K_2SO_4 or K_2CO_3, etc. In contrast to the ease of indentifying inorganic elements and ions is the difficulty of identifying the thousands of organic substances known to exist.

When the Bureau of Soils began growing plants in subsoils there was a good deal of talk and some literature about anaerobic bacteria producing alkaloids—ptomaines which accounted for soil infertility. Yet it was found by actual experiments with alkaloids that they did not poison the soil solution. Phenol was found to be beneficial, and pyrogallol especially beneficial. Its fertilizing effect could not be due to its supplying plant food, since it has only C, H, and O in its composition, and none of these are characteristic of any kind of the mineral fertilizers. Pyrogallol was found by experiment to be the best fertilizer known for wheat, except air, and its one striking peculiarity is its power to absorb oxygen. It therefore required some further explanation to account for the fact that green manure, clover for instance, is so poisonous to wheat, while the same plants, if allowed to wilt and decompose, form a good fertilizer. By considerable effort these excessively toxic substances were isolated and examined. This work forms the basis of the following theory.

Theory of soil fertility. No organism can live in its own excreta. Plants, like all other organisms, excrete toxic substances. This poisonous excreta is partly composed of the broken and decomposing cells

which every root sloughs off in its passage through the soil, and partly doubtless of waste material excreted as such. These toxic plant excreta all readily oxidize, giving new substances which are never toxic to plants. but very stimulating. Aeration of a soil by cultivation or otherwise is of value in this connection, besides being of enormous advantage in increasing the adsorptive power of a soil. The excreta from one plant is generally not harmful to other plants, that from cowpeas and clover being especially good for wheat. The plant root generally moves faster in the soil than the solution it absorbs. This gets it away from its own excreta, organic and inorganic. Plant roots have somewhere back of the area or zone of absorption near the tip, other areas or zones which cause oxidation.

In supoprt of this theory reference is made to the Bureau's finding that plants while young have more mineral matter in them than at maturity, and that a poor crop from a poor soil has more than a good one of same variety, from a rich soil, and also the fact that a saturated solution of allylene has been turned pink by wheat roots, due probably to an enzyme (oxydaze) washed off of the roots of wheat seedlings which dip into it. These facts fit in with the theory that infertility of a soil is not due to a lack of mineral food so much as an excess of toxins (poisons) in the accumulated excreta.

Methods of investigation. In the work with soils the plan followed in the laboratories of the Bureau was usually to leach out of the soil with pure water such minerals as are dissolved by water, since these solutions are more nearly comparable to the form in which plants take their food than would be solutions made with the strong acids that the chemist ordinarily uses. Since the soil is such a good adsorber, any other adsorber, such as boneblack, is useless in soil work. But where adsorption is desired in experimenting with this clear soil solution, some such substance is used.

The habit of plant roots of hugging such hard surfaces, as they in their growth come in contact with, thwarted the study of root behavior in earthen pots, where they would be found matted against sides and bottom. Field conditions of root growth were more nearly reached by the use of a pot made of paraffined wire net, where the paraffin permeated the earth for a space inward from the wall.

Lantern slides showing principles and methods. The remaining statements in support of the theory were presented in the form of lantern slides, accompanied by running comment in explanation of each, the special lesson of each of which may be summed up in a sentence or two.

The plotted curves [See Bulletin No. 22, Bureau of Soils, p. 22.] illustrate the fact that the adsorptive capacity of a soil varies inversely with the size of the soil particles, being greatest with clay, less with silt, and least with sand. Ability to adsorb gradually diminishes as more and more of the soluble mineral is taken, and ceases

at a saturation point, however much the percentage of the mineral in solution may be increased. From this maximum constant, which is a function of the internal surface of the soil, the amount of adsorbed minerals is abruptly lowered by leaching with pure water, diminishing less gradually as the minimum is approached. The minimum, like the maximum, is a constant for the particular soil and all others of the same texture, but like the maximum, varies inversely as the size of the soil particles, or what is the same thing, varies directly as the internal surface. From this minimum no amount of leaching can lower the mineral content. With strength of solution plotted on the horizontal axis and amount of adsorption on the vertical axis—the adsorptive curve for any soil bears a rough resemblance, in its upward and downward course between the two limits, to the upward stroke of a small script n, coupled to the downward stroke of a small verticle script u, beginning and ending somewhere about the base line on zero point, and directed horizontally at each limit.

The character of a soil may be greatly changed by adsorptive condensation or a bunching into flocks (flocculation) of the soil particles. Bases (alkalis and metals) generally have a deflocculating effect, causing the separation of flocculated soil particles, while acids generally cause flocculation. Flocculation of a very fine clay would make it behave in some respect like a coarser textured soil. Lime is a notable exception to the rule that bases cause deflocculation. Its greatest value to the farmer is often due to its disposition to flocculate clay soils, making them porous.

Wheat seedlings were generally used for testing the physiological properties of the soil solution. These were sprouted just above the solution on rafts of gauze coated with paraffine and floated by corks. [See Plant World, 9, 13 (1906); also Bulletin No. 40, Bureau of Soils.] The roots penetrate the gauze and dip into the solution where they secure their food and excrete their poisons. By another device the plants are grown in wide-mouthed bottles whose corks are notched to hold ten seedlings each. The plants and truncated wedges of cork are secured in their respective gaps and the whole put in position in the mouth of the jar containing the soil extract.

The remaining slides show work done with soil solutions only. Clear glass vessels were used, the light having no apparent effect on the proper functioning of the roots.

Lantern Slides Showing Results. In a series of pots the affect of increasing the strength of the fertilizing salts from 27,000 to 55,000 parts per million in water showed a lessening of the vitality of the plant to a point beyond which they could not survive. The superior adsorptive power of clay over silt, and silt over sand was shown in the diminished vigor of plants where these three adsorptive agents were used in solutions of equal strength. Another series shows that the amount of plant food may vary very widely in percentage of

soil solution without affecting vigor of plants, both upper and lower limits being marked by stunted plants (the figures unfortunately not recorded by the reporter). An interesting slide showed a natural soil solution inferior to distilled water as a source of mineral food until treated by an adsorptive agent, (carbon black) when it became better. Similarly a fractional dilution of a soil solution showed increased vigor of plants through seven successive stages, owing as in the next preceding case, to the presence of a toxin. [See Bulletin No. 40, Bureau of Soils, Plates 1 and 2]. The toxic effect of distilled water was diminished by increased amounts of carbon black resulting in increased vigor of plants. Absorbent cotton has a similar effect.

A water solution of an infertile soil gave a poor growth of flax seedlings, but where boiled the toxin proved volatile and the growth was good. [See Bulletin No. 40, Bureau of Soils, Plate 3]. Carbon black was not so good as boiling, but better than the best commercial fertilizer.

A second crop of wheat from the same soil was injured by the presence of waste matter given off during the previous year's growth. Where treatments which remove harmful waste matters were applied two and even three crops could be grown successfully in a soil solution; for example, a soil solution grew three successive wheat crops, each better than the preceding, the only treatment being to shake the solution with carbon black for the second and increase the dose for the third crop.

A Kentucky coffee tree had a toxic effect on vegetation feeding in the same soil. Cumarin, a toxin excreted by growing clover, is poisonous for all other plants until oxidized. Vanillin is a toxin from roots of sugar beets and decayed wood as well as in the vanilla plant.

Black rot of the sweet potato produces a toxin in the soil to which seedlings succumb. Young seedlings suffer more from toxins than do later stages of growth. Toxins have characteristic crystals, some of which have been identified. Spicular and stellar forms are characteristic. Dioxystearic acid has been identified in a Tennessee soil. A soil sick from five successive crops of cowpeas was found to have a crystalline toxin. In a comparison of toxins from roots, tops, and seed, the last was found to have greatest effect and the roots the least.

Cowpea sickness of a soil due to four successive previous crops on the soil was corrected by use of lime. Potassium sulphate had little effect until lime was added. Tryosin, a proteid degradation product was very beneficial to the plants after oxygen had been absorbed by it. Green manure was very toxic, compared with the same in a ripened condition. The value of a green leguminous manure may not be due to the nitrogen in it.

Barnyard manure is valuable for the organic matter as well as the mineral matter in it. Such organic portion may be separated by dialysis. The growth of a seedling in a soil solution extracts nitrates from it, the vigor of successive crops increasing as the nitrates decrease. Nitrates are never more than transient duration in the soil.

Mineral fertilizers enormously increase the rate of oxidation of roots. Such fertilizers, whether phosphate, potash, or nitrogen, should be added sometime before planting the crop. More than three weeks is unnecessary. *The effect of fertilizers is not on the plant, but on the soil.*

Conclusion. Our knowledge of soil toxins is all in harmony with what we know about the best cultivation, rotation, and fertilizers. Aeration by cultivation is one of the best ways of treating soil toxicity. The use of fertilizers is another. The theory of toxins only can account for the fruitfulness of alluvial soils which as a class are poorer in fertility than others, and for the necessity we often see for the use of fertilizers on the irrigated soils of the west, which are often very rich in mineral food. Rotations are of value because they permit one plant to use as a food or a stimulant the excreta of the previous crop which would otherwise be extremely toxic to the same species. The rotation method is nature's way of correcting a soil and we frequently see such rotation as ragweed and grass following a crop of wheat in a stubble field left to natural influences.

OTHER VIEWS.

Dr. H. W. Wiley, Chief of the Bureau of Chemistry, U. S. Department of Agriculture.

"The principles of fertilization depend upon the fact that a soil of good quality should have returned to it all that the harvest has removed and a poor soil be supplied with those elements in which it is defective. Nothing can be more certain than that a soil in which this restoration is not fully made will gradually lose its faculty to produce plants in normal quantity and composition." [Quoted from Farmer's Bulletin No. 52, p. 14.]

Dr. E. Davenport, Chairman Committee on Experiment Station Organization and Policy, Associations of American Agricultural Colleges and Experiment Stations. Director, Illinois Experiment Station.

"This [Bulletin No. 22, Bureau of Soils] is commonly understood and is certainly intended to mean that the use of farm manure, the growing of clover and other leguminous crops, as a source of nitrogen, or the applications of bone meal or other fertilizers has little or no tendency toward permanent soil improvement, and that even the effect which they do produce is due very largely, if not entirely, to improved physical conditions of the soil.

This sudden and radical departure from the established lines of agricultural science struck at the very basis of soil investigations in progress in this state (Illinois), and notice of these remarkable statements could not be avoided. This bulletin has been widely read and

unfavorably received by all who are capable of judging its merits. It has been welcomed by land agents with poor lands for sale and these are making the most of this opportunity.

This Experiment Station entertains the hope that Illinois farmers will not permit their ideas of the importance of soil fertility to be disturbed by this unfortunate incident, but that they will go on treasuring the fertility in their soils for economic use and not ignore or waste the plant food required to make crops." [Quoted from Circular No. 72, Illinois Experiment Station.]

Dr. C. G. Hopkins, President of the Association of Official Agricultural Chemists of the United States, Washington, D. C., Nov. 8, 1906.

In the nine years' results with wheat at the Ohio station, the combined effect of nitrogen and potassium was less than 2 bushels increase when applied without phosphorus, while the three elements produced an increase of more than 14 bushels, although phosphorus alone produced less than 7 bushels increase. Wheat must have these plant food elements for its growth and development; but under the Bureau's theory we must assume that this Ohio soil contains three different kinds of toxic substances, of which one is destroyed by nitrogen, another by phosphorus, and a third by potassium.

To assume that the beneficial effect of these different plant food carriers is due to the correction of toxic substances assumed to exist is an absurdity and without foundation in known fact.

If any conclusion can be drawn from the Rothamstead data, it is that crop rotation is a means not of maintaining soil fertility, but of depleting it, even more rapidly than can be accomplished by a continuous one-crop system. Indeed, this result is to be expected. Any method by which larger crops are produced without the addition of plant food must result in a large removal of plant food and consequently in a more rapid depletion of the fertility of the soil, whether it be accomplished by crop rotation, by better cultivation, or by the use of better seed.

Among all the nations of the earth, the United States stands first in rapidity of soil exhaustion. The improvement of seed, the use of tile drainage, the invention and immediate adoption of labor-saving agricultural machinery, the wonderful development of cheap and rapid means of transportation, and the opening of the world's markets to the American farmer have all combined to make possible the rapid depletion of American soil.

If the theory which is being widely promulgated by the National Bureau of Soils, to the effect "that practically all soils contain sufficient plant food for good crop yields, that this supply will be indefinitely maintained," and that "the fertility of the soil can be maintained, by arranging a system of rotation and growing each year a crop that is not injured by the excreta of the preceding crop," if this theory is forced upon, and accepted by, the farmers of the United States during the next quarter of

a century, it would doubtless require another quarter-century to eradicate it from the mind and practice of the masses. Who shall try to estimate the possible damage to American agriculture if this teaching shall be allowed without contradiction to pass from the place of highest national authority into general acceptance?'' [Quoted from President's address, 1906.]

C. A. Mooers, Chemist and Agronomist, University of Tennessee Agricultural Experiment Station.

Dr. Cameron in his lectures on the soil emphasized a number of the views which may be said to be peculiar to the Bureau of Soils, with which he is connected. That these views are considered to be extreme even to the point of ridicule by some of the best known agricultural chemists of both this and foreign countries is a well-known fact. The result of much severe criticism has probably had the effect of placing the lecturer in the position of an advocate who uses every argument to carry his point with the jury. Along with the lectures, therefore, some brief statements and a little data on the other side should be given, especially for those not familiar with the subject.

The Value of a Chemical Soil Analysis.

There is evidently a misunderstanding on the part of many agricultural writers in regard to the purpose of the usual chemical soil analysis. By the Official Method, and by that of Hilgard and others, the object is to extract all the mineral plant food which can possibly become available over a long term of years and thus to get information in regard to the permanent producing capacity of the soil. The results obtained by the two methods would not be expected to affect seriously the conclusions. Of course it is preferable to make use of a uniform method of analysis, so that the results will be strictly comparable. The methods which make use of citric acid, salt solutions, etc., have been devised with an entirely different object in view: namely, the determination of the immediately available supplies of the mineral elements of plant food. Probably all of the latter are of value, but none is recognized as well established and standard.

In regard to the results of the analyses by the Official Method, etc., they have been of exceptional value in some sections of the country. Tennessee furnishes an excellent example in this direction, for as a result of the chemical work on the various type soils the natural plant food supplies of each type has been determined so that it is possible to outline definite policies in regard to the use of fertilizers. Certain geological formations give rise to soils which analyze very low in phosphoric acid, for instance, and are always found to respond at once to any one of a number of different phosphates. On the other hand we have discovered large areas where the soils analyze high in phosphoric acid and do not respond to phosphating. In fact, we have found as a result of both the laboratory and field work that there is a very close agreement between the

chemical composition and the fertilizer requirements of all the upland soils of the State. Hilgard, the leading authority on this subject in America, says that the failure to distinguish between the "ascertainment of the permanent productive value of soils against that of their immediate capacity" has been the cause of much of the misunderstanding which exists. He says further that "virgin soils showing high percentages of plant food as ascertained by extraction with strong acid invariably prove highly productive; provided only that extreme physical characters do not interfere with normal plant growth, as is the case with heavy clays or very coarse sandy lands. To this rule no exception has been found." On the other hand, these analyses should not be expected to show the effects of recent manuring, which may, however, be ample to produce a marked temporary increase in crop production. If these statements be true the corollary can be drawn that the soil solutions of different soils are not equally well supplied with plant food as maintained by the lecturer. That they are unequally supplied has been directly demonstrated by the experiments of King and numerous others, such as Th. Schloessing, fils, who are of the highest standing.

With regard to the loss of fertility under cropping and the sufficiency, as claimed, of various agencies, such as the different forms of animal and plant life (which certainly help), to restore the loss, the Rothamstead experiments show conclusively that the loss over a term of years of both the available supplies of the mineral elements and of total nitrogen is large and can easily be estimated by chemical analysis. With this decrease in plant food there was in the course of 40 years a pari passu decrease in the yield of barley from 25 to 12 bushels per acre. Of course where winds are active agencies in shifting the soil such results could not have been obtained. Under usual Tennessee conditions erosion must to a very appreciable extent renew the soil supplies of the mineral elements of plant food - so that a soil naturally rich in the minerals, like some to be found in the Central Basin, even after many years of cropping, never seems to be in need of increased supplies. With nitrogen, however, the case is different, for the subsoil is poor in this element, so that the nitrogen washed away can only be slowly replaced by the action of soil bacteria.

The Classification of Soils.

There probably is no one satisfactory simple basis of soil classification. Soil texture is only one of the important factors which have had to do with soil fertility. To classify soils by it alone would be to ignore the very important factor of plant-food supply, on which frequently depends the kind of farming to which the particular soil is adapted. Geological origin as a universal basis of classification is not satisfactory for under different climatic conditions different soils will result. For example, Knox dolomite would not be expected to produce on disintegration the same kind of soil under both humid and arid conditions. On the other hand, it is a well-known fact that there are large areas over which each of the various rock formations has given rise to soils of

strikingly similar characteristics with respect to color, texture, and fertility. Tennessee again affords a splendid illustration of this result, and after much study of this subject the writer has come to the conclusion that geological origin furnishes the only true basis of soil classification for the major part of the uplands and of this and numerous other states.

The Litmus Test.

The litmus test for soil acidity has long been used by agricultural chemists. That the absorption property of a soil may influence the result is undoubtedly true, but, on the other hand, that this test when properly conducted gives valuable information can hardly be doubted. The experiments made by Dr. Cameron showed the maximum effect which can be produced by the absorptive power of the soil. When the litmus test is properly made the factor of absorption is reduced to a minimum. If absorption were a predominating factor the difference between limed and unlimed "acid" soils could not be detected, and the heavy clays and the clay loams would uniformly show the most acidity. Such, however, is frequently not the case. At the Experment Station farm there is at the present time a clay loam soil which reacts decidedly acid to litmus, but only very faintly so where lime was applied three years ago at the rate of about one ton to the acre. A light sandy loam from the Cumberland Plateau, where the soils are exceedingly poor in lime, gave in a recent litmus test a strong and immediate acid reaction. To draw the sweeping conclusion that the litmus test is of no value so far as soils are concerned is, to say the least of it, most extreme.

The Wire Basket Method.

The wire basket method of testing soils is claimed to indicate the fertilizer requirements of a soil. According to the present views held by the Bureau of Soils it might better be called a method of testing the effects of fertilizers on the toxins of the soil. It is certainly not a safe guide in regard to the plant food requirements, as has been proved by comparisons made at different places between the basket and field trials. Some of the results of the wire basket tests, which consume only a few days, have been published in connection with surveys of Tennessee soils, and are at marked variance with the well-known requirements of the soils in question.

Toxins in the Soil.

That a normally fertile soil may get into an unsatisfactory condition of productiveness for other reasons than a lack of plant food, moisture, or good physical condition has been long known. Soil bacteriologists claim—and give good evidence in its support—that this is due to the action of certain harmful bacteria which gain the ascendency in the soil. Perhaps plant roots give off poisonous substances, as claimed by the Bureau, which are especially noxious to the variety from which they come, but more evidence seems to be needed that this is so. Certainly some, if not much, of the evidence given by the lecturer can be simply explained on another basis. The common expression "clover-sick land," for example, has come about, as has been amply demonstrated by Bain and Essary, not by a soil condition but by a fungous disease.

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U. T. FARMER, University of Tennessee, Knoxville, Tenn

THE NEW EDUCATION.

[From the New York Independent.]

The real education of a people is a product of its own struggle for existence.

Whatever it may have obtained from historical sources, and whatever it may have been taught by those set apart and appointed to instruct children and youth, a people has to find out for itself what it can make of the natural resources of its environment, how it can mix and blend the miscellaneous elements of its population, and in so doing it has to re-think and reformulate the wisdom that has been transmitted to it from the experience of the race.

In America, the processes of popular self-education are going on actively and in interesting variety. And notable among these should be named the steadily increasing and widely diffused interest of the great agricultural population of the Middle West and South in the practical problem of using the soil to the utmost advantage and of selecting and breeding those vegetable and animal products that are best suited to our lands and our markets. Scientific knowledge and the work of the agricultural colleges and experiment stations throughout the country are marvelously transforming both the economic condition and the mind of the agricultural population. The net result can be stated in a word. The American farmers are ceasing to be at the mercy of the elements. Dry and wet seasons no longer carry with them the same fatefulness that they once did. The farmer begins to understand that his fate is almost entirely in his own hands. He knows that he can be sure of the product of his own foresight, intelligence and industry, and he becomes thereby as a thinking being, less superstitious, less the victim of alternating fear and hope, more the reasoning, calculating, scientific man of the world.

What a splendid addition this conception of education will be to the factors that can be depended on to support the best traditions and to push the most hopeful reforms of American political life! These millions of farmers will be no helpless creatures of corporation rule; they will not tamely submit to the building up of a great plutocracy on the ruins of republican institutions. The agricultural basis of our American political experiment is still sound, and instead of narrowing, it is to be wider and firmer than ever before.

THE U. T. FARMER

Vol. 2. MARCH, 1908 No. 6

AN EXPERIMENT WITH IRISH POTATOES.

In the spring of 1906 the writer began a simple experiment with Irish potatoes to determine the relative merit of eyes from the bud end and from other parts of the tuber, and to determine to what extent the yield is affected by different kinds of seed pieces. The results of the first year were so interesting that during the past season the experiment was continued on a somewhat modified and enlarged scale. The soil used for the experiment during 1906 is a rich garden soil which will yield upwards of 100 bushels of corn; that used the past season is rather compact, contains some gravel and is not as productive.

The following is an outline of the experiment: No. 1. Bud ends of large potatoes were used for seed. No. 2. Halves of the potatoes from which the bud end had been taken for No. 1. No. 3. Halves of small potatoes with the bud ends rejected. No. 4. Large potatoes with bud end rejected. No. 5. Large potatoes with bud end rejected and all eyes but one destroyed. No. 6. Large whole potatoes. No. 7. Small potatoes. No. 8. Small potatoes with bud end rejected and two pieces to the hill. The estimated yields per acre are based on 14,520 hills per acre or distances of 3 ft. by 1 ft.

Below is a tabulation of results. It will be observed that in 1906 five methods of cutting the seed were tested and that these with four additional ones were tested in 1907.

In the results obtained in 1906 it will be observed that the largest yield as well as the most profitable was obtained from using for seed large potatoes with the bud end rejected. However, the net return from usine halves of large potatoes with bud end rejected were but very little less. The least profitable returns were obtained from using the halves of small potatoes minus the bud end. The bud end in this case proved to be unsatisfactory seed, and a greatly diminished yield resulted from reducing the eyes of the tuber to one.

In the gross yields of 1907 it will be observed that practically all of the results of the previous year are confirmed and some additional points of interest brought out. The largest yield was obtained by using large whole potatoes for seed and the smallest was again No. 3. There seemed to be no disadvantage in discarding the bud end of small potatoes though this may not be confirmed in succeeding tests. Also from the results obtained in Nos. 4 and 9 it would seem that it is better to use a whole potatoe in the hill than to use two halves.

1906.

Method of cutting seed.	Number of hills.	Large potatoes, lbs.	Small potatoes, lbs.	Yield per acre, large potatoes, bus.	Yield per acre, small potatoes, bus.	Seed required per acre.	Net yield per acre, large potatoes, bus.	Net yield per acre, small potatoes, bus.
No. 1.....	42	64.5	6	371.64	34.57	80.66	290.97	34.57
" 2.....	42	93	8	535.09	46.1	40.33	494.75	46.1
" 3.....	44	51.5	5	283.5	27.5	8.4	283.5	19.1
" 4.....	42	100	11	576.9	63.38	80.66	496.23	63.38
" 5.....	44	83	9	456.5	46.16	80.66	375.83	46.16

1907.

No. 1.....	55	37	2.5	162.8	11	80.66	82.13	11
" 2.....	55	40.75	5.75	179.3	25.3	40.33	138.96	25.3
" 3.....	55	31	3.25	136.4	14.3	8.4	136.4	5.9
" 4.....	55	49	15	215.6	66	80.66	134.93	66
" 5.....	55	41.25	7.5	181.5	33	80.66	100.83	33
" 6.....	55	60	13.75	264	60.5	80.66	183.33	60.5
" 7.....	55	36	11	158.4	48.4	16.8	158.4	31.6
" 8.....	55	36	8	158.4	35.2	16.8	158.4	18.4
" 9.....	55	41	12.5	180.4	55	80.66	99.73	55

When the net yields are studied it is seen that the results of 1906 are not altogether confirmed. The large amounts of seed required where one large tuber was used in planting a hill, or in the case of No. 2, one-half reduced the net yields so that the small potatoes ranked second for profitable returns. From results so far obtained it would seem to be profitable to plant whole large potatoes for seed when a rich and suitable potato soil is available, but that in case of a poorer soil, low in humus is the kind used, it would be safer to plant small potatoes or pieces of large potatoes. It would seem so far to be a bad practice to cut off and throw away the bud end of large potatoes. It would seem better to use one large piece—or entire potato—to the hill rather than two pieces of one-half the size each.

Of course this experiment must be conducted under varying conditions for a number of years yet, before definite conclusions may be drawn; the investigation is merely begun. LAKE R. NEEL

CO-OPERATIVE EXPERIMENTS.

This work was begun in Middle Tennessee last year. The great area of this section prevented experiments being conducted in every county. Nor was it necessary to do this, since there are really only four separate and distinct soil types in Middle Tennessee.

Along the eastern border, including parts or all of Cumberland, Fentress, Van Buren and Grundy counties, is a sandy loam covering the rocks from one to five feet deep. The soil contains little plant food and is badly in need of organic matter.

West of the Cumberland plateau and extending around the central basin is a region known as the Rim. It is composed of two classes of soils—the white and the red. The latter is located as a rule farther from the basin. The red soil is of a limestone origin, and while not so fertile as the limestone soils of the basin, is much better supplied with plant food than the other types with which we have to deal. It produces remarkably well under good management. The Clarksville section is famous for its dark tobacco crop, and elsewhere trucking crops are yielding good returns. The gray soil is not derived from a limestone formation. It constitutes a narrow strip around the basin and contains a large amount of silt. It is by no means a fertile soil, but under good farming methods improves slowly, although at best is hard to manage.

The central basin soils are the most fertile and durable in the middle section of the state. They are dark clay loams with a yellow clay subsoil. While they readily respond to good farming, they have been handled injudiciously for a number of years with fairly good results. Crops common to other sections of the state grow well—potatoes, corn, winter cereals, and blue grass are the principle crops.

Experiments were conducted last year at the following places:

County.	Locality.	Crop or Treatment.
Cumberland	Crossville	Corn.
"	Creston	Corn, etc.
"	Pomona Road	Corn.
Overton	Livingston	General Farm Crops.
Putnam	Cookeville	Cantaloupes, corn and forage crops.
"	Baxter	Cantaloupes.
Smith	Gordonsville	Forage crops.
White	Sparta	Alfalfa, alsike, cowpeas and soy beans.
Warren	McMinnville	Cowpeas, followed by wheat.
"	Daylight	Corn and forage crops.
Coffee	Tullahoma	Corn and forage crops.
Giles	Pulaski	Cowpeas, followed by wheat.
Maury	Spring Hill	Cowpeas, followed by wheat.
Robertson	Springfield	Alfalfa—fertilizer experiments.
Montgomery	Clarksville	Fert. expts. on tobacco.
"	Carbondale	Fert. expt. on tobacco, varieties of peanuts and soy beans.
Sumner	Gallatin	Forage crops.

Experiments properly conducted at the above places will furnish reliable data for every class of soil in Middle Tennessee. It has been planned to extend the work into several other counties during the coming season, testing fertilizer requirements and varietal differences of many crops.

The standard size plot is one-fortieth of an acre, the dimensions being 18 feet wide and 60.5 feet long, with a 2 ft. path between adjacent plots. When lime is used it is applied to one-half the plot at the rate of 2,000 pounds per acre.

When selecting a site for an experiment many factors are taken into consideration, such as uniformity of land, previous cropping and fertilization, and its adaptability. After the land has been selected it is the plan of the Station to furnish and apply fertilizer and seed, and give directions for cultivation with as much personal supervision of the work as possible. At harvest time results are carefully weighed and recorded, after which the crop is disposed of by the co-operating grower.

EWING HITE, Assistant Co-operating Experiments.

THE NEW WORLD'S RECORD.

The remarkable cow Colantha 4th Johanna 48577 has now the undisputed title of Champion Cow of the World. On December 22, 1907, she finished her year test far ahead of the Guernsey cow Yeksa Sunbeam

15439. Ach. R. 331, who had previously held the record. In fact Colantha 4th Johanna equalled 857.15 pounds of butterfat, Yeksa Sunbeam's record, in ten months and one day.

The new record is 27,432.7 pounds of milk testing 3.64, making 998.26 pounds of butterfat. Figuring this at the usual oversum is equal to 1,165 pounds of butter, worth at the present price approximately $350. The skim milk at 20 cents per hundred is worth $52.86, about the value of the total product of the average cow. A son of Colantha 4th Johanna, Johanna Colantha, had recently sold for $8,000.00. This cow has broken, not only the yearly record, but every previous butterfat record as well; namely, the one, seven, thirty, sixty and hundred and twenty day tests, her record being

	Milk	Test	Fat
1 day	90.6	5.07	4.94
7 days	651.7	4.32	28.76
30 days	2,873.6	3.86	110.83
60 days	5,326.7	3.91	208.39
120 days	10,521.2	3.76	395.28
1 year	27,432.7	3.64	998.26
Average daily yield	75.2	3.64	2.73

People will talk of this record and call it miraculous. It is nothing of the kind. It has been brought about with almost mathematical exactness. The achievement is the result of applied scientific knowledge on the part of the owner and breeder, Mr. Gillette, of Rosendale, Wis.

In the first place the cow is the result of scientific mating. Both her dam and sire were pedigreed Holsteins with performance records. Both were vigorous, of typical dairy conformation and with a long line of heavy milking ancestry behind them. In the second place she has been carefully fed and handled from a calf toward the end of becoming a heavy producer. In her fourth year she produced 693.20 pounds of butter fat; thirdly, during the period of test she was carefully watched and heavily fed, her feed during the seven day test being about 30 lbs. grain mixture of equal parts by weight of bran, oats, gluten feed and 3 lbs. of oil meal.

It was a scientific victory. The cow was bred, trained and fed for the championship. She is certainly a wonderful cow, but the same method which placed her ahead of Yeksa Sunbeam will one day produce her peer, and this same method if adopted by the average farmer would double the yield of the average cow in five years or less.

Two cows have excelled Colantha 4th Johanna in the production of milk. They are likewise both Holsteins. One, Princess of Wayne, produced 29,009 pounds of milk in a year; the other, Pietestye 2nd, produced 30,318 pounds.—Students' Farm Review, University of Missouri.

METHODS FOR SAVING FRUITS AND EARLY VEGETABLES FROM LATE FROSTS.

If protecting crops from frosts is to be practiced on an economical basis the grower must have reliable information as to when a frost is to occur. This information can be obtained from the United States Weather Bureau, which sends out warnings at least twenty-four hours in advance of every damaging frost during the growing season.

The grower must also know something about the formation of frost and must be familiar with the methods of preventing it. On a calm, clear night, the plants on the ground lose their heat by radiation to the air above, and by evaporation of moisture from their surfaces.

When the surface of the earth becomes cooler than the air in contact with it, a thin layer of air is cooled by conduction, and this thin layer in turn cools the next layer and so on.

In this way a stratification takes place in which the coldest layer is at the bottom and warmer layers are higher up. If there is enough moisture in the air to saturate it at a temperature above the freezing point, say 34° F., when the temperature has fallen to 34°, dew will begin to form and there will likely not be much further fall, as the condensing water vapor will give off enough heat to check the downward tendency. But, if there is only enough moisture present to saturate the air at a temperature of 30° F., and if the temperature should fall to that point, the condensing moisture will be in the form of frost instead of dew.

To prevent frost then, the grower may do three things; he may stop radiation, he may add heat to the air, and he may add moisture to the air.

It is a well known fact that damaging frost seldom occurs on a cloudy night. This is because the cloud layer checks radiation of heat from the ground. This may be done artificially by building numerous small fires that give off considerable smoke, thus forming the cloud blanket needed to keep the heat in. These fires will also add to the heat in the air, and thus prevents frost. To add moisture to the air these fires should be of damp material, such as wet straw or leaves or stable cleanings.

In actual practice, any method of protection may help in one or two, or even in all three of the above mentioned ways.

To prevent radiation plants may be covered thickly with straw or leaves, or, in the case of Irish potatoes, may be covered with earth by running a turning plow by the side of each row and throwing the dirt on top of it.

To prevent radiation and also add heat, coal fires may be used. These should be small and close together, as a large fire creates too much draft and the heat is carried too high. Small baskets made of

chicken wire, and large enough to hold a gallon of coal are about the right size, and should be placed about 50 feet apart under ordinary circumstances. The baskets should be filled with coal and kindling and placed in the field before-hand, and then when the cold night comes a little coal oil is poured on each one and it is lighted.

The damp smudge is better as a prevention of radiation than the coal fire, but adds less heat to the air. It, however, adds a great deal of moisture, and is one of the most efficient methods for preventing frost.

The smudge fires, like the coal fires, should be small and 50 feet or less apart. They may be of wet straw, leaves or any damp material. Prunings may be profitably used in this way if an orchard is to be protected. These fires are also started with a little coal oil.

A very efficient and practical form of the smudge is the portable smudge. Four stakes are set up on a wagon or sled, and over them is stretched a wire netting, on which is placed the damp material. The wagon bed is covered with dirt to prevent burning, and on this is built a hot fire of coal or tar, or other inflammable material. There must also be a barrel of water on the wagon in order that the straw may be kept wet. This machine may be driven to any part of the field in which it may be needed most, and as it is kept constantly moving the fire is not in one place long enough for an upward draft to be formed, though it may be very hot.

In this way a low lying cloud of steam and smoke may be spread over a considerable area with very little expense.

Before closing, one other method will be considered. It was seen that the air next the ground became cold first, and that layer after layer became cooled by contact with the cold air below. This process is very slow, and on an ordinary cold night the air would be cooled but a very few feet above the ground, and trees with their heads above this cold stratum would be safe from frost. But the greater density of this cold air that keeps it next the ground also causes it to flow down an incline, just as water does. As a result the cold air runs off of the hills and slopes into the valleys, where it soon becomes deep enough to submerge the tallest fruit trees, while on the side of the hill there is only the thin layer last formed.

Therefore, tender vegetables and fruits should be planted on hills and slopes where the cold air can drain off readily, while the hardier or later varieties may be placed in the valleys.

J. F. VOORHEES, '09.

THE TENNESSEE MULE.

Maury county, Tennessee, is a great mule growing district, the fame of her four-footed products extending around the world. The Columbia Herald tells us that Tennessee has a big source of wealth in mule growing. There are very few mules, it says, in the states of the North, none in the New England states, and the greatest number are found in the former slave states. There are only two states that produce more mules than Tennessee, and they are Texas and Missouri, in the order named. On January 1, of last year, there were 631,000 mules in the Lone Star state, and 315,000 in Missouri. Tennesee had 275,000 mules. Although this state had 40,000 fewer mules than Missouri, the value of the Tennessee mules was almost equal to that of the Missouri mules.

Tennessee mules bring more money than the mules of any other state. On Jan. 1, of last year, the average farm value per mule in this state was $112, while the average farm value of the Missouri animal was only $104. The Texas raised mule on that date was worth on the farm only $93. Next to Tennessee, Kentucky raised the highest priced mules, but they are worth an average of $3 less than the animals of this state.

The total value of the mules of this state on the first of last year was approximately $31,000,000. It is probably a million more at this time. Mules reached their lowest price in 1897. The average farm value per head at that time was only $41.66. Every year since there has been an increase. In 1898 the price was $43.88; in 1899, $44.96; in 1900, $53.55, and the following year $10 more. In 1902 the gain was only $4, and during the next year the price increased but $5, but from 1904 to 1905 there was a gain of nearly $10 and during the following year the increase was almost $11. The greatest advance ever made in the prices of mules took place during 1906, the price per head being $14 more on January 1, 1907, than it was a year before. The farm value of the mules in the United States was almost $100,000,000 more on January 1, last year, than it was a year previous to that date, being $428,063,613.

The aggregate farm value of the mules of this country was less in 1897 than it was during any year since 1869. On January 1, 1897, the mules of the United States were worth only $92,000,000. Ten years thereafter they represented in the farmer's hands $428,000,000, an increase of 500 per cent. It is small wonder that the farmers of the South are prosperous.

TUBERCULOSIS IN CATTLE.

Cattle are among the most susceptible to tuberculosis of the domestic animals. A large per cent. of cattle are destroyed by the various forms of tuberculosis, especially in cold climates, where the cattle are housed in close barns during the winter.

As this disease is spreading every farmer should be able to recognize its presence and help guard against its ravages. The indications are various. They include the following, viz: "thin carcass and lacking in depth, a narrow chest, and loin, flat ribs, large barrel depression and hollow flanks. (2) Extreme thinness and fineness of the head, neck, and withers, want of fullness in the eyes, hollowness behind the ears, undue fullness under the jaws and a small and narrow muzzle. (3) Much prominence of the bones in certain parts, as at the joints, and a coarse and ungainly appearance. (4) And a hard, unyielding skin, thin and dry hair, and irregularity in changing the coat." All of these appearances should be understood as indicating tuberculosis.

All the cattle which present the above appearance are probably affected with tuberculosis but there are some diseased individuals which show no external indications. Then it is best to examine the entire band. This can be done by the use of the tuberculin test.

"Tuberculin is a culture liquid into which the germs of tuberculosis have been introduced and allowed to vegetate. The germs of the human tuberculosis patient are introduced into the culture and allowed to multiply until the culture is thoroughly saturated with their toxic products. The culture is then heated sufficiently to kill all germs or passed through a porcelain filter to remove them; if filtered, not heated, and vice versa. The heated or filtered liquid, called tuberculin, is put in sealed bottles and does not contain a dead or living germ of any contagious disease.

The cattle which are to be examined should be tied about 12 o'clock. At two o'clock their temperature should be taken and the test applied.

About 30 drops of tuberculin for every thousand pounds of body weight is injected under the skin with an ordinary hypodermic syringe, which has been thoroughly disinfected. The evidences as to the presence of the disease are indicated by the temperature and are as follows:— "The injection of tuberculin into a healthy animal produces *absolutely no effect.*" In an animal affected with tuberculosis, it causes a marked rise in the temperature between the 9th and 16th hour after the injection. The amount of rise in the temperature which follows the injection of tuberculin into a tuberculous animal depends largely upon the extent of the disease in such animal. In the early stages the rise is very marked, sometimes amounting to from four to six degrees; that is, the temperature after injection will be from four to six degrees higher than it was

before the injection. The further advanced the disease the less will be the reaction of tuberculosis, until, in an animal which is very badly diseased only a very slight reaction can be expected. This test should never be attempted by any but a veterinary doctor.

As a certain cure for tuberculosis has never been discovered, we can not do anything for those animals which are already diseased. The best thing is to obtain cattle which are neither affected nor predisposed to the disease. Then in order that they may never become affected they should be kept away from diseased animals and under conditions which do not favor the development of the tuberculosis germs.

There are several predisposing causes of tuberculosis aside from inheritance. "These include disorder of the digestive organs, food deficient in quantity, impure water, confinement in dark, damp, filthy, unventilated apartments, and undue exposure to cold or to any other influence that lowers the action of the vital powers." The extent to which cattle have been confined in damp, dark, and ill-ventilated stalls is perhaps responsible for the great extent to which tuberculosis prevails more than any other single external cause. Cattle raised on the ranges are but little subject to tuberculosis, notwithstanding that in many instances they are subjected to privation because of short supplies of food. This fact should be carefully considered by those who require to keep cattle housed much of the time in the winter. It emphasizes the necssity for supplying them with ample fresh air in the stables and also with sufficient exercise.

As many herds are affected more or less they should be examined occassionally. The ones which are found to be diseased should either be destroyed or quarantined against. Those which are affected by the disease or predisposed to it should not be used for breeding purposes as their off-spring will inherit this characteristic.

A. THETFORD, '09.

Born on a Berks county farm, I passed through the public school, the academy, the college, and the university, and cannot recall one iota of instruction which would have made me a better farmer or more contented with rural life. The teaching was designed to inspire ideals and to fit for callings which ignore the advantages of a life spent upon the farm.

I claim that it is the function of the school, especially in the country, to point out the prizes which the soil offers to skilled husbandry. In the next place, it is the province of the rural school to open the eyes and minds of children to the marvels which are transpiring all around them. —Dr. N. C. Schaeffer, Supt. Public Instruction, Pennsylvania.

AGRICULTURAL EDUCATION.

More About the Plot System.

In answer to inquiries regarding the plot system as set forth in the January Farmer, we desire to give additional explanation for the benefit of all who may be interested.

In its variety this plot system provides no more than the minimum of demonstrations necessary to show the most important principles of soil preservation coupled with the most profitable crop production for general farming. But in amount of work entailed it is near the maximum to be expected of high schools. As provided, the dimensions of plots and the quantities of fertilizers suggested are the same as are used in the work of Mr. Hite elsewhere described.

The succession of crops in Series I being: 1, cowpeas; 2, wheat; 3, clover and grass, and 4, corn, may be lengthened into a five year rotation by letting the clover and grass run a year longer. While this change may be advisable in farm practice it does not increase the value of the demonstration for school purposes and requires the space and labor of a fifth range in the series. To those who begin the permanent work later than 1909, attention is called to the fact that the letters A, B, C, and D are applied permanently to the ranges as shown, while the crops move to the left, one step each year; the step from range A being to range D. All printed instructions on each plot or range move forward with the crop.

Since the high school, where this system is maintained as here planned, would be all the better suited to the possible use of the Agricultural College as the seat for an annual short course for farmers and since the Department of Agricultural Education desires to be a clearing-house for results, criticisms, and alterations for all schools looking to us for this aid and advice, any changes from the plan designed to lessen the work should first come to this department. The advantage of a uniform system for the entire state, whereby teachers may be able to communicate by letter or conference, to report results on a blank provided by us for permanent record and in making possible the distributions of a brief printed annual report of all the schools for the benefit of all, will appeal to all systematic workers.

Two Books.

"Agriculture, through the Laboratory and School-Garden," by C. R. Jackson and Mrs. L. S. Daugherty. Of the many books on agriculture intended for public schools, few are of proper grade for high school use. For elementary grades it is generally recognized that nature study methods and materials are the best foundation for elementary agriculture. For high school use the attitude changes in this as in all other science work and becomes more or less technical, analytical, inductive and quantitative. And this book, hailing from the Kirksville, Mo., State Normal School, recognizes these essentials of a high school text in agricul-

ture as does no other book we have seen on this subject. As it is easy to overdo the technical in a work intended for immature students, the skill in preparation of this book is shown in the elimination of all but the essential, thus making it possible to illustrate all the important principles of agriculture without introducing more science than the average high school is prepared to teach.

Recurring to the rural school of youthful or more recent years, one recalls the idea that prevailed among pupils of practical turn who were out of sympathy with the false pedagogical ideals that dominated the schools—the idea that 'rithmetic was the only subject worth studying after one had learned to read and write. Could such pupils have foreseen the possibilities of arithmetic in the use of fertilizers, rations, and milk products as set forth in this book, how many active intellects might have been saved for the training which was due but denied them. And how much further along might now be this great reform of getting agriculture onto a pleasant, profitable and self-perpetuating basis.

The primary science required for a proper preparation of pupils for using this text is of such character and amount as to be readily compassed in a year, together with the entire text, where presented by lectures and demonstration by the teacher. Elementary chemistry, the use of symbols, formulae, and equations, and the significance of acids, bases, salts, and reactions, as well as a knowledge of plant physiology should be given along with the lessons as provided. The book provides numerous experiments and exercises peculiar to the subject of agricultural science and calculated to keep the teacher out of his chair most of the time, whether himself or his pupils do the laboratory work.

The book is especially strong in its treatment of soil physics and fertility, feeds and feeding, milk, and horticulture; and, except the last subject, is stronger on principles than on practice. It of all books is best calculated to take the student with little or no knowledge of agricultural science and with the proper instruction put him where he can use and enjoy agricultural literature as prepared by the agricultural investigator. It smacks strongly of the pedagogue in its classification and presentation under topical headings. [Illustrated. Cloth, 403 pp., $1.50, Orange Judd Co., New York, 1905.]

"Soils," by C. W. Burkett, Director of Experiment Station, Kansas State Agricultural College. After careful perusal of the first half of this book we have come to the conclusion that, considered either as a scientific treatise or a piece of English composition, it is about as bad as it can be, admitting that the unread half is all that it should be. Its ambiguity, verbosity, and forced rhetoric stare from every page, while the war between grammatical elements, the careless and inaccurate use of scientific terms and the failure to say what is evidently meant, are apparent to him who looks closer. These faults are seen to be partly due to choosing unwisely when the opportunity offers to state a conclusion concisely, or to state it with some show of rhetoric.

But these, while the most apparent faults, are insignificant compared to the patent blunders in science, and more especially the pernicious inferences that pervade the scientific atmosphere of the book, the instances of which are "too numerous to mention." Merely because scientists have sometimes shown a contempt for agriculture is not sufficient excuse for agriculturists to retaliate by showing a contempt for science. The personification of nature and the treating of chemical affinities and protoplasmic tropisms as conscious and volitional belongs to mythology rather than to a serious science. A Christian Science of the Soil offers a convenient creed to those who from preference, or lack of knowledge, reject the conclusions of investigators and is certainly less opposed to long established, harmful agricultural practices. But its recognition in places of highest authority has not made it acceptable to the democracy of science. Whatever interest the book may have to informed readers, it should never be put into the hands of immature students to which it is (apparently) addressed. [Illustrated. Cloth, 303 pp., $1.25, Orange Judd Co., New York, 1907.]

The country has too many problems for the uneducated man. To thrive on the land one must know what the land is, and he must have that knowledge of plants and animals which is practical for everyday life. There is no room any longer for those who do not keep pace with the revelations of science. It is hard to conceive anything more helpless than the farmer who knows nothing of the legumes and bacteria, and the possibilities of making soil of a fat sort out of poor sand or solid clay.

The problem of hard work in the country is staggering to a great many—hard work and dirty work. They wish to move into the town to get rid of labor. They still educate their children along the lines of least resistance. They wish them to be so taught that they may pass out of the ranks of laborers and become ladies and gentlemen. The only answer to these folk is, that we have got to reverse our whole conception of work. Amusement is the most wearing employment of human beings. It kills quicker than hard toil. The whole structure of the human being means work. The hands are our glory because they are the forefeet of animals, exalted to the achievements of art. The brain never does anything nobler than to devise tools for the hand.—New York Independent.

When tillage begins arts follow. The farmers therefore are the founders of civilization.—Daniel Webster.

EDITORIALS.

The Department of Superintendence of the National Educational Association held its annual session Feb. 25-27 in Washington, D. C. The fact that so large a share of the program was given to the subject of agricultural education indicates the importance that educational leaders attach to the subject. Since attending this meeting State Supt. R. L. Jones has, if possible, been surpassing his former record as a speaker and advocate of agriculture in the public schools.

We would like to say something for the special benefit of that county superintendent who refuses to take his Farmer from the post-office for fear that it will cost him 50 cents at the end of the year, but he would likely be the last person on earth to profit by the remarks, and we do not care to inflict them upon our loyal supporters. His county will probably be a stronghold of prejudice against the educational progress which is active in his neighboring counties. The Farmer does not claim to be the sole means of furthering the cause of agricultural education, but when furnished, as it is, free of charge, the refusal to receive it is a good index of the attitude of the suprintendent toward the interests of his schools and the demands of his farmer constituants.

The Farmer acknowledges receipt of the preliminary announcement of the third session of the Graduate School of Agriculture, to be held this year at Cornell University and the Geneva, N. Y. Station, July 6-31, under the auspices of the Association of American Agricultural Colleges and Experiment Stations. Prof. G. N. Lauman, of the College of Agriculture, Cornell University, Ithaca, N. Y., is Registrar, and Director A. C. True, of the Office of Experiment Stations, Washington, D. C., is Dean. Instruction adapted to the needs of graduate students will be given under the general heads of biochemistry, agronomy, horticulture, dairy husbandry and dairying, poultry, veterinary medicine and entomology.

The faculty includes a number of the best men from the Department of Agriculture, the New York State Veterinary College, and representatives from the Rothamstead Station, England, and the Royal Agricultural College of Germany, with a large portion of the regular Cornell faculty. Specialists from nine other state agricultural colleges are also included. Of these, eight represent the nineteen colleges associated with state universities, while four represent the twenty-nine state colleges not so associated. The colleges so represented are Pennsylvania, Illinois (3), Missouri (2), Massachusetts, Iowa, Minnesota, Wisconsin, Nebraska and New Hampshire.

PERSONALS.

Prof. C. A. Keffer made a special trip to Johnson City to address the Old Soldiers at their home.

The conditions of the crops at the farm is very encouraging, and it is safe to say that the growth for the time of the year is equal to any in the past.

Owing to the development which had occurred with the fruit at the fruit farm, it was necessary to keep fires in the orchard during the recent cold spell.

Every day adds something to the grandeur of our new Agricultural building, and, when completed, with its modern improvements it will be one of the best buildings on the hill.

Prof. Morgan has gone to Memphis and Tiptonville, where he will be engaged in University Extension Work for several days. During his stay, he will deliver several lectures.

The short course, which came to an end a few days back, was the best in the history of the institution. The "short-horns" were very busy during their stay with us, and much interest was manifested by them.

Mr. C. A. V. Evans has taken charge of the clover work, under the able direction of Profs. Essary and Bain. Mr. Evans is an efficient worker, and will no doubt prove a great help. He hails from Louisiana, and is a graduate of L. S. N.

Newton C. Myres, short course, '06 and '07, is engaged in the breeding of Polled Durham and Shorthorn cattle, near Greeneville, Tenn. He has recently added some excellent individuals, secured in northern Indiana, to his herd. Mr. Myres also does general farming, and is an active member of the county farmers' institute.

East Tennessee is on the boom, as shown by the farmers' institutes held in various counties during the month of March. S. E. Barnes, M. Mooers, S. M. Bain, F. C. Quereau, C. A. Keffer, and H. A. Morgan, of the faculty, took an active part in these meetings. They were working in cooperation with Commissioner Dunn and Supt. Jones.

On the third Wednesday night in January, the Agricultural Club met with Dr. Jacobs. Officers were elected, and a general discussion on the elective and non-elective courses was engaged in by the students and professors. After the adjournment of the meeting, and when all were preparing to leave, Dr. Jacobs announced that something else was in store for us. We were shown into the dining hall, where a sumptuous feast awaited us, and to say that all enjoyed themselves is but a mild way of expressing it. Every student seemed to appreciate the kindness of Dr. Jacobs, and it was only one of the few instances which tend to show the ties of friendship existing between the faculty and students.

Examination has descended on us again, but with less fatal results than before. We hope to present even a stronger front after the next one.

Messrs. Hite and Converse departed a few weeks since for Middle Tennessee to take their co-operative experiment work.

A. J. McCracken, short course, '05, is farming and raising live stock near Clyde, N. C. His specialties are Hereford cattle and Rambouillet sheep.

We are glad to hear of the gradual improvement of Col. Thompson, Commissioner of Agriculture, who has been seriously ill at his home in Nashville.

Wilson, '10, and Johnson, '09, were compelled to go home on account of sickness in their families. Neither will be able to return for the spring, but we expect to have them with us next fall.

J. H. Meyer, short course, '07, is engaged in market gardening at Hill City, Tenn. He thinks that the short course and the U. T. Farmer are splendid investments of time and money for the young men of Tennessee.

The agricultural club, as shown by the attendance, is increasing with each meeting. At a recent meeting, the staff officers on the U. T. Farmer for the ensuing year were elected. They promise to carry on the work which has been so ably started.

A. C. Morgan, short course '08, a graduate of Cornell and government entomologist, visited the Hill recently in company with his wife. They were en route from New York and Washington to Clarksville, Tenn., where his work in tobacco cultivation will be resumed.

Alva P. Gaut, short course, '05, is running a dairy farm at Martel, Tenn. Mr. Gaut keeps a herd of thirty Jersey cows, grade and thoroughbred, and sells the whole milk to the East Tennessee Dairy Company, at Chattanooga. He uses the scales and tester, so he can cull out the boarders and keep only the profitable cows. His herd last year averaged a little less than six thousand pounds.

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Contributions from members of the Club and from the Alumni of the Agricultural Department are especially requested.

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THE FARMER AND CITIZENSHIP.

We do not want to see our farmers sink to the condition of the peasants of the old world, barely able to live on their small holdings, nor do we want to see their places taken by wealthy men owning enormous estates which they work purely by tenants and hired servants.

At present the ordinary farmer holds his own in the land as against any possible representatives of the landlord class of farmer—that is, of men who would own vast estates—because the ordinary farmer unites his capital, his labor and his brains with the making of a permanent family home, and thus can afford to hold his land at a value at which it cannot be held by the capitalist, who would have to run it by leasing it or by cultivating it at arm's length with hired labor. In other words, the typical American farmer of today gets his remuneration in part in the shape of an independent home for his family, and this gives him an advantage over an absentee landlord. Now, from the standpoint of the nation as a whole it is preeminently desirable to keep as one of our chief American types the farmer, the farm home maker, of the medium-sized farm. This type of farm home is one of our strongest political and social bulwarks. Such a farm worked by the owner has proved by experience the best place in which to breed vigorous leaders alike for country and city. It is a matter of prime economic and civic importance to encourage this type of home owning farmer.

Therefore, we should strive in every way to aid in the education of the farmer for the farm, and should shape our school system with this end in view. Too often our present schools tend to put altogether too great a premium upon mere literary education, and therefore to train away from the farm and the shop.

We should reverse this process. Specific training of a practical kind should be given to the boys and girls who when men and women are to make up the backbone of this nation by working in agriculture, in the mechanical industries, in arts and trades; in short, who are to do the duty that should always come first with all of us, the duty of home-making and home-keeping. Too narrow a literary education is, for most men and women, not a real education at all; for a real education should fit people primarily for the industrial and home-making employments in which they must employ the bulk of their activities. Our country offers unparalleled opportunities for domestic and social advancement, for social and economic leadership in the world. Our greatest national asset is to be found in the children. They need to be trained to high ideals of every day living, and to high efficiency in their respective vocations; we can not afford to have them trained otherwise. [Theodore Roosevelt.]

THE U. T. FARMER

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THE PLACE OF SOJA BEANS IN TENNESSEE AGRICULTURE.

To anyone who is familiar with Tennessee conditions it is very apparent that we do not produce meat, beef, mutton, and pork in proportion to the demand, or in proportion to that produced by our sister states. That the fertility of our soil must depreciate unless more of our farm products are marketed in the form of meat, butter, eggs, and wool, is too apparent to require discussion. The last decade, however, has seen a great increase in dairy products, and much of the hill country that has heretofore been lying idle is now pasturing flocks of sheep. But in the matter of beef production, we are much farther behind than the demand or our resources would warrant. The reason is found in the fact that we have been trying to follow the feeding standards that have been set up by other sections whose conditions are different from ours.

It chances that the section of the Middle West known as the Corn Belt is peculiarly adapted to the raising of the corn plant. Farmers of that section found that the most profitable form in which to market the comparatively cheap corn that they raised so abundantly was that of high-priced meats. As a result, that section became famous for the production of beef and pork, and Chicago came to be one of the greatest markets of the world. Now, the logical question arises, is it because corn is better fed than any other that this development has taken place, or is it because corn could be produced more cheaply than any other feed? Corn is a carbonaceous fat-producing feed, and when fed exclusively—lavishly—as it is, or has been done in that section of the West, great results have been attained in the way of fat animals. Nothing succeeds like success; so the standard of feeding cattle for large gains has been set with corn as the basic principle. As time went on, however, and corn advanced in price, even the feeders of the Corn Belt discovered that it was more economical to balance the ration with a protein food such as oil meal, or cotton seed meal. This last, the most valuable feed, as well as the best source of nitrogen as a fertilizer that the South produced, was cheerfully exchanged by those who produced it for timothy hay and corn. The real reason that more beef is not produced in Tennessee lies not in the fact that the average Tennessean does not like a thick, juicy steak fully as well as his brother across the Ohio river, but because he cannot grow corn as cheaply as it can be grown in the Middle West.

As a machine for the conversion of unsalable roughage as well as the salable portion of the farm crop into a high-priced product, thereby eliminating a source of great waste in the farming business, the beef

animal is a factor that can not be considered lightly, and must be made use of if we hope to succeed and retain or increase our soil fertility, which, in the last analysis, is the surest guide to our material progress.

The Experiment Station early recognized that beef must be produced, and that Tennessee could not compete with the Corn Belt states if corn be fed, as it is fed there, to produce results. Therefore, experiments were inaugurated to determine if possible what Tennessee grown crops could be used to the best advantage in steer feeding, and exactly the amount of beef that a single acre would produce; also to determine the increase of soil fertility when the manure was returned to the land from which the crop was fed. Tennessee can produce two crops besides corn that will largely supplant corn and render steer feeding profitable, as will be seen from the results of these experiments. These crops are soy beans and cow peas—crops that can be grown profitably in any section of the state. Director H. A. Morgan, of the Experiment Station, believed that the solution of the steer feeding problem, together with that of soil improvement, was to be found in these two crops, and the fair and exhaustive comparative test that he has been running during the past two years indicates to the most skeptical and the firm believer in King Corn, that he was right in his premise.

The experiment was made on the Experiment Station farm, which is a representative Tennessee farm of the better class. An area including three separate measured acres was laid off in one of the fields and planted, respectively, to corn, cowpeas, and soy beans. These acres were cultivated as the other farm crops were cultivated, and the entire crop from each was harvested separately, carefully weighed and set aside to be fed. The experiment was started in 1906. In November of that year twelve steers were purchased; they were grade steers that would class medium to good in the feeder class on the Chicago market. The steers were separated into lots of four each. To these steers were fed the products respectively, from the corn, cowpea, and soy bean acres, the object being to determine how long each acre would feed four steers, and the total amount of gain that could be obtained. The peas and beans were threshed from the straw with the Koger pea thresher. The peas and beans were each ground into meal. The corn was fed in the form of corn and cob meal. The corn stalks were passed through a silage cutter and the other feed mixed with it. The pea and soy bean straw was fed as it came from the pea thresher. All feed was well mixed before feeding, and each lot received an equal amount of silage in order to add succulency to the ration. It may be stated that the steers did not at any time go off feed in two years that the experiment was run. In the experiment of 1906-07 the corn acre produced 34 bushels of corn and 3,035 pounds of stover at a cost of $14.00 per acre, including a charge of $5.00 per acre rent. As the accompanying table shows, this fed four steers 54 days, beginning Dec. 8, 1906, producing a total gain of 128 pounds

at a cost of $0.093 per pound of gain. The acre of cowpeas produced 12 bushels and 42 pounds of peas and 1,365 pounds of straw. This fed 54 days, producing a gain on four steers of 261 pounds. The cost per pound of gain was $0.053. The soy bean acre produced 19 bushels and 36 pounds of beans and 2,905 pounds of straw. This produced in four steers a gain of 406 pounds at a cost of $0.034 per pound. These results were surprising, to say the least, as well as very suggestive, when it is remembered that this experiment was conducted under very uniform conditions. It will also be remembered that during this feeding period about 13,440 pounds of manure was produced, which is worth $2.50 per ton.

This year (1907-8) the experiment was repeated in the same way. The crop on the acre plots produced and fed about the same length of time as last year; namely, the peas and corn 54 days and the soy beans 80 days, beginning Dec. 2, 1907. The corn acre produced a total gain of 203 pounds in 54 days at a cost of $0.068 per pound. The cowpeas produced a total gain of 327 pounds in 54 days at a cost of $0.043. The soy bean acre fed 80 days with a total gain of 540 pounds at a cost of $0.026 per pound. It will be noticed that each of the lots of steers received only the products raised on the respective acres, with the exception of the silage, of which all received exactly the same amount. In other words, each of the lots was fed on the same principle that corn is supposed to be fed on, and all three lots were being fed on a more or less unbalanced ration. That in the lot fed on corn was manifestly too wide, while the

ACRE FEEDING EXPERIMENTS AT UNIVERSITY OF TENNESSEE STATION FARM, BEGINNING DECEMBER 8, 1906, AND DECEMBER 2, 1907.

	Days fed	Concentrates		Roughage		Silage		Gain		Concentrate fed per lb. gain.	Cost per lb. gain at $14.00 per acre
		Total	Per steer per day	Total	Per steer per day	Total	Per steer per day	Total	Per steer per day		
CORN ACRE FED TO FOUR STEERS.											
1906–7	54	2450	11.34	1912	8.85	4320	20	129	0.592	19.10	$0.0937
1907–8	54	2450	11.34	1662	7.55	4400	20.37	203	0.939	12.06	0.0689
SOY BEAN ACRE FED TO FOUR STEERS.											
1906–7	80	1133	3.54	3585	11.20	6814	21.29	406	1.27	2.78	0.0344
1907–8	80	1184	3.70	3280	10.25	6640	20.12	540	1.68	2.11	0.0259
COW PEA ACRE FED TO FOUR STEERS.											
1906–7	54	751	3.49	2404	11.12	4240	19.62	261	1.208	2.87	0.0536
1907–8	54	751	3.49	2200	10.18	4400	20.37	327	1.510	2.29	0.0428

Concentrates refers in case of the corn acre to corn and cob meal and in the others to bean and pea meal respectively. Roughage in case of corn acre refers to stover and in the others to the thrashed straw. The silage fed was not produced on the acre. Figures indicating quantities (excepting first two and last columns) indicate pounds.

lots fed on the peas and beans would perhaps have made better gains had the carbohydrate content been a little higher.

The results of these experiments, covering two years, point most strongly to the fact that an acre of land when planted to soy beans can be made to produce more than twice as much beef as can be produced on the same acre when planted to corn, and that by following such methods, steers can be fed off and sold at a profit to the feeder at the same price per pound that they were purchased for—a circumstance hardly to be conceived by any possible market depression. Not only is the immediate profit in dollars and cents higher, but the increase in soil fertility by the growing of a nitro-gathering plant is greatly increased. To this may be added the increase in organic matter by the addition of the manure, which contains over 80 per cent of the elements of plant food that were removed from the soil by the crop.

Now, this does not mean that it will not pay to grow corn; it simply means that corn should not be fed in as large quantities as has heretofore been the rule, and it means that by the improvement of the farm more corn may be raised per acre, thereby permitting a reduction in the acreage necessary to produce the required amount.

There is not a section in Tennessee that will not grow soy beans, and with the assurance that they can be marketed in the form of prime beef and pork, there is no reason why Tennessee should not enter into competition with those states that now boast of their meat-producing resources.

There is a growing demand for good beef and pork, both in quantity and quality, with strong emphasis on the latter. The East Tennessee Packing Co., owners of the only abattoir with facilities for the final manufacturing process of animal products in East Tennessee, have recognized that this growing demand must be met, and their efforts to meet it by taking a lively interest in the growing of better live stock, in the work of the Station, and in the building up of a good local market, are worthy of commendation. The steers fed by the Station—twenty-eight in number, representing about 32,043 pounds live weight, will be sold on the local market of Knoxville. If the people of Tennessee will but produce the meat in sufficient quantities and of a standard quality so that Knoxville can be made a distributing point for this part of the state and adjacent states, the question of a market will take care of itself. If the farmers will produce the meat, the enterprising business men of this section will attend to it that Cincinnati or Chicago is not the most desirable or profitable market for the sale of beef and pork. F. C. QUEREAU.

CORN IN TENNESSEE.

The success of Prof. Holden of the Iowa College of Agriculture, in inducing the farmers of that state to test their seed corn before planting, whereby the average total annual yield of corn in that state has been greatly increased, has directed the eyes of agriculturists all over the coun-

try to his achievement. On several occasions Prof. Holden has on invitation addressed Tennessee farmers and explained his method of selection and testing to eager audiences. His address at Nashville, in November, 1906, has been published in pamphlet form for distribution by the State Department of Agriculture.

The value to Tennessee of this careful method of selecting seed would be great beyond computation if put into practice. But there are other considerations regarding corn production here of equal importance to the state, and this is said without desire or expectation of belittling the importance of seed testing before seeding of any crop. The point to remember always in applying Prof. Holden's recommendation, is that he does not come here as an advocate of increased acreage of corn for Tennessee. On this point one who catches the enthusiasm of the man may make the mistake of misapplying his teachings. Rightly applied, his teaching is that the practice of careful testing of seed corn should, if generally followed, enable Tennessee to raise more corn on the present acreage, or what is better economy, raise as much on a less acreage.

The most reliable figures at hand [Year Book, Dept. Ag. 1906] shows Tennessee to rank eleventh in total acreage of corn for that year, but also shows her to rank thirty-third in average yield per acre. It seems better economy to raise her rank in the latter list than in the former. And if her rank in average yield per acre could be raised, as would doubtless result from the careful testing of seed corn, she might diminish her acreage without a decrease of total yield. We are not ready to take the position that Tennnessee needs a diminished yield, but we think it a consummation devoutly to be wished when a farmer can diminish his hard labor without financial loss.

With the old time practice of selecting seed, merely by sight, it is not at all uncommon to find a 75 per cent. stand where a careful sprouting test of a half dozen kernels from as many different parts of the ear would give a 90 per cent. stand or better. And when one has to hop clods behind a double shovel that has locomotor ataxia, through the hot days of June, it is calculated to make a thoughtful man of him. And when he reflects that with a 75 per cent. stand, where he might have had a nearly perfect stand, for every three clods he hops necessarily he hops a fourth just for the fun of it or because his seed wasn't perfect, the reflection ought surely to make a philosopher of him. We advocate the seed corn tester as strongly as any one can, but advocate it simply as a labor saver. Were we in Iowa we might advocate it as an increaser of yield. The reasons for this distinction are geographic and climatic.

It is a fact well known to geologists that many ages ago a great glacier similar to those now existing in Greenland pushed and spread itself Southward from the region of Labrador and Hudson Bay across the present site of the Great Lakes and the St. Lawrence Valley. The area

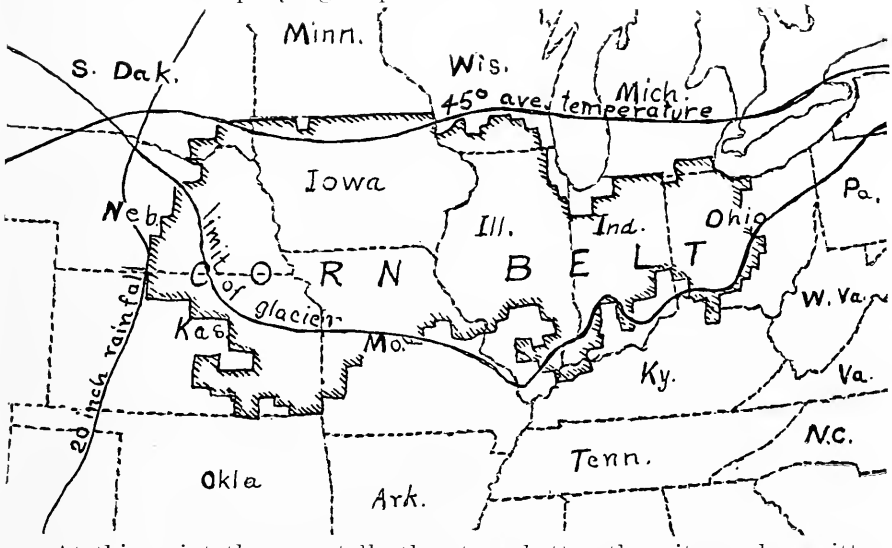
covered by this glacier is easily recognized by the mixed soils which have no kinship to the underlying rocks of the earth's crust, by the way in which somewhat artificial lakes and hills were made and by the polished and scratched boulders. The lower limit to which the glacier extended southward was somewhat north of the present position of the Ohio river and somewhat beyond the Missouri river, being farthest south in southern Illinois. Above this line the soil is generally loose and loamy, because of its various materials having been so thoroughly mixed and is in many places very level because of the mode of its formation and distribution. It forms a distinct physiographic region known universally as the prairies. Its texture, fertility, and ease of cultivation peculiarly adapted it to extensive cultivation of the corn plant which was introduced there from the older Eastern States by the early settlers.

But soil conditions are not the only ones to which the corn plant is specially sensitive. Corn is easily killed by frost and in its highly bred condition very sensitive to drought. The former fact fixes the northward limit in the prairies to which corn may be profitably grown and the latter fixes its westward limit, though outside the prairies as they have been defined. This northward limit has been pushed farther north by the breeding of early maturing varieties of corn. The westward limit is doubtless being pushed farther westward by the achievement of so-called dry farming. But it is doubtful if we will ever see corn grown successfully west of the 20 inch annual rainfall line. Perhaps 25 inches is the present limit.

That 25-inch limit is a fickle will-o-the-wisp that calls for special consideration. To its habit of migrating periodically back and forth, east and west, over the state of Kansas, is due the hope that springs eternal in the jayhawker's breast that he may some day "raise as big a crop of corn as he did eight years ago." when it was cheaper than coal and was burned for fuel. It is probably not true as has been stated that the Populists are in the majority west of this line and the Republicans east of it, and that the swinging of the line changes the political complexion of the state, whereby statesmen are made and unmade. At any rate the 25-inch limit is outside the glaciated area, though the soils are quite similar in texture owing to their too having been transported, in this case by winds. In fact, the adaptability of the corn plant to the texture of soil materials that are transported is apparent whether the transportation be by means of glaciers or winds or are what are more familiar to us, river bottom lands.

Referring to the last census (1900) as to corn yields in the United States, we find a map on which the area devoted to corn raising is shaded, the varying yields of different sections being roughly indicated by four degrees of shading—the area of highest yield being shaded most heavily and those of less yield bounding this heavy central portion indicated by three lighter degrees of shading passed through in going outward

to the unshaded area. This heaviest area is very irregular in outline, bounded by county lines, and includes all counties in the United States which have a total yield for the year 1899 (the year on which the census was based and an average year) equal to 3,200 busels for every square mile in the county. This making the county rather than the acre or the square mile the unit, results in making this area of greatest yield somewhat compact and contiguous, whereas the high yields of isolated fields or farms of the Eastern States are rightfully lost in their county averages. For want of a more exact definition this area of highest yield is called on the accompanying map the Corn Belt.



At this point the map tells the story better than it can be written. On this map three lines are drawn. One passes through those points at which the average temperature for the year 1899 as given in the Weather Record was 45 degrees. The average for the spring and summer months, if available, would probably have been better. This line may be seen to follow pretty closely the northern boundary of the Corn Belt. On the west the 20-inch rainfall line for the same year formed the *ne plus ultra* on that side. And on the south we find the line marking the southern limit of glaciation forming a sort of hammock into which the Corn Belt fits as snugly as a blue jay's nest in the forks of an apple tree. (The figure is more accurate than the fit). It would seem that if any extended area wishes to raise corn in commercial competition against this area it should first find some way to bend these lines so as to get inside these limits. The fact that Tennessee clay may be made to produce as high yields of corn on limited areas as does the Corn Belt, does not argue that it should be attempted in competition with an area where the expense of producing a bushel is half as great as here. What can't Tennessee clay be made to do by the use of barnyard manure? Nor is this condition a matter to be regretted. Agriculturally Tennessee has a higher destiny.

Corn, wheat, and oats are three cereals that are much alike in the fact that they are produced cheaply over wide areas and sold profitably by a class of farmers whose fertile soil has not heretofore compelled them to consider the value of the fertility subtracted from it by the removal of crops. Increasing use of labor-saving machinery, improved varieties of plants and better seed have, while increasing the profits, also increased their loss of fertility. Happy for them if enlightment comes before soil exhaustion. In the meantime, can Tennessee, who is compelled to buy her fertility in sacks, to till broken lands, to forego the use of much machinery suited only to the prairies, to battle against erosion and weed and insect pests unknown to the prairies, afford to compete against these products of the prairies? Surely not while there is so much more profitable kinds of agriculture for her.

That this lesson is already learned by some communities is evidenced by the increasing interest in dairying and trucking and the raising of stock for meat and other products. The keynote of Tennessee's agriculture should be the conservation of her soil fertility. The law of compensation in the matter of supplying the fertility removed in a crop may be seen here in a year or two's farming at most, and we are right up against it.

The fertility requirements for a bushel of corn are sufficient for the growth of fruits and vegetables worth many times as much as the bushel of corn. The feed necessary to produce a dollar's worth of meat will produce mule and horseflesh worth twice as much. The corn with the nutritive ratio of 1 to 10, used wastefully to fatten the corn belt hog, that should have a ration balanced at 1 to 6, could in Tennessee have its value greatly increased by mixing with peas and beans and thus narrowing to the required standard. The butter and cotton fibre for which there will always be a demand at profitable prices, may be produced here as cheaply as anywhere else on the globe and without loss of fertility. All these considerations suggest a self supporting agriculture infinitely more interesting and diversified than the agriculture of the corn belt, and in which Tennessee can compete on equal terms with any region on earth.

JOSIAH MAIN.

THE SEED CORN TESTER.

The seed corn tester is a light wooden box about two feet wide, three feet long and five inches deep. In the bottom of this box put about two inches of wet sawdust, well packed.

Take a piece of muslin somewhat larger than two by three feet and rule it in black lines both directions making rectangular checks about two and a half by three inches. Stretch this cloth smoothly over the sawdust in the box and secure it to the sides by tacking it on with light strips of wood all around. Number the checks down the left hand narrow

margin from one to seven or eight. Beginning with number one, number them across the top on the wide margin from left to right, the series being 1, 11, 21, 31, etc. Every check on the cloth will then have a number though it need not be written in the check. For instance, check 76 will be in the row numbered 71 at the top and will be the sixth check in that row standing opposite the figure 6 on the left margin.

The selection of the proper type of ear and plant is a matter that should have been attended to before frost in the fall. Of the ears so selected take one and remove six grains, from it that are so located as to get the best sample from that ear. The best way. is to get two from near the butt on opposite sides of the ear, two from the middle on opposite sides and two from near the tip. If the ear be turned one sixth of the way after taking a selection at the butt and turned again one-sixth more after taking selections at the middle the six grains selected will represent six different rows on the circumference of the ear and three locations on its length thus getting one or more grains from any portion of the ear that may for any reason be defective.

The grains may be gouged out with any hard-pointed instrument, being careful not to damage the germ, and are placed on a check in regular order so that if disturbed by shaking they may readily be put in place. The rectangular check accommodates an arrangement somewhat like the six spot domino. The heart side should be upward to show readily what effort the grain may have made toward germination.

Into the butt of each ear as its sample is placed in the check, shove a sharp peg flattened and having plainly marked on it figures to correspond with the check. The ears should then be put in a safe place for preserving and identifying at the close of the test.

Over the checked cloth, now covered with samples, spread another piece of muslin carefully down over the grains, and on top of this a third piece on which two inches more of wet sawdust is packed.

Essentials for germination include moisture, air and heat. If the sawdust used in starting the test was dripping wet it will not be necessary to further consider the first two. The temperature most favorable to germination of corn is about 90° Faht. This may be hard to secure in winter or early spring, but a lower temperature is not objectionable if it doesn't go below 50°. The lower temperature is a severer test and may be most like soil conditions, but will take about two weeks whereas the most favorable temperature does not require more than one week.

In deciding which ears to keep for seed and which to reject it is well to have a passing grade and a definite system of grading ears. Where one desires a 90 per cent stand of corn he should reject every ear which fails to sprout one or more of its grains in the tester. And if grains that are tardy in sprouting are given only half value, which is a good rule, two tardy grains should condemn the ear while one would not.

Whatever standard is adopted should be adhered to for best results and the ears sorted into two lots, the one to be preserved for seed and the other cast out.

At the end of the germination period the sawdust on top is removed by lifting off the cloth. The second cloth prevents dislodging the grains while doing this; then the second cloth is lifted and the seedlings exposed for examination.

A tester of this size will be sufficient for a six or seven acre field as usually planted and if begun early enough the test may be repeated a number of times before seeding begins.

MARGARET BROWN,
Concord, Tenn.

FARRAGUT H.S.
April 17, 1908.

DRUDGERY.

Our prime elements are due to our drudgery—I mean that literally; the fundamentals, that underlie all fineness and without which no other culture worth the winning is even possible. These, for instance—and what names are more familiar? Power of attention; power of industry; promptitude in beginning work; method and accuracy and despatch in doing work; perseverance; courage before difficulties; cheer under straining burdens; self-control and self-denial and temperance. These are the prime qualities; these are the fundamentals.

When I think over that list and seriously ask myself three questions I have to answer each with NO:—Are there any qualities in the list that I can afford to spare, to go without, as mere show qualities? Not one. Can I get these self foundations laid, save by the weight, year in, year out, of the steady pressures? No, there is no other way. Is there a single one in the list which I cannot get in some degree by undergoing the steady drills and pressures? No, not one. Then beyond all books, beyond all class work at the school, beyond all special opportunities of what I call my "education," it is this drill and pressure of my daily task that is my great schoolmaster. My daily task, whatever it be, that is what mainly educates me. All other culture is mere luxury compared with what that gives. That gives the Indispensible. Yet, fool that I am, this pressure of my daily task is the very thing that I so growl at as my "drudgery." [William C. Gannett.]

AGRICULTURAL EDUCATION.

Following are the courses in agriculture offered by the University during the Summer School, June 23-July 31, 1908.

Agriculture for Public Schools.

PROF. MORGAN. PROF. KEFFER, PROF. MOOERS, PROF. MAIN, MR. PRICE, MR. TYLER, MR. QUEREAU, DR. KNAPP, MR. WING, DR. CROSBY.

The College of Agriculture of the University of Tennessee last year established short courses for teachers of elementary agriculture in connection with the Summer School of the South. The interest was very great. The results have been beyond expectation. These courses will be repeated this year, with added facilities. The object is not only to teach the elements of agriculture, but to give to teachers of rural, elementary, and high schools methods of presenting the subject. The courses are illustrated by field excursions, observations on growing crops and farm animals, practice in school gardening and plant propagation. These courses are open to all students of the Summer School.

I Agronomy. Principles and practice of modern agriculture, illustrated by stereopticon. Excursions to the Experiment Station farm. The most important cereal, forage and grass crops. Especial attention to the varieties, culture, improvement, and judging of corn. Crop rotations, especially such as are adapted to Southern conditions. Soils—their origin, chemical and physical composition, the bacteria which they contain, adaptability to farm crops, etc. Plant foods and the necessary elements, with particular regard to the properties and sources of those most important in agriculture. Five periods. Six weeks. Prof. Mooers.

II Animal husbandry. Types and breeds of farm animals—especial attention to those most suitable to Southern conditions; live stock judging—a study of the general conformation of animals for specific production; animal breeding—a general discussion of the principles of stock breeding, including the subjects of variation, selection, heredity, cross breeding, etc.; animal nutrition—the laws of nutrition, and a discussion of the physiology of the various body systems and the relation of a general food supply to their normal operations; the feeding of live stock—sources, composition, and digestibility of various feeding stuffs; compounding and balancing of rations, with especial reference to that which may be profitably produced upon Southern farms. Five periods. Six weeks. Prof. Morgan and Mr. Quereau.

III Bee-keeping. Life history, habits and types of bees; handling, inspection and feeding; swarming; equipment of a model apiary; construction of hives; site, pasturage, feed, protection in summer and winter; improvement of apiary; queen rearing; enemies, diseases and remedies; weak colonies; bee-keeping as a business; how to start; surplus honey, comb, extract; grading and care of honey; marketing and shipping; machine for extracting; general management; practical experience and excursions to apiaries. State Bee Keepers' Association. Five hours. Two weeks—June 23-July 3.

IV Dairying. Practical lectures and demonstrations in butter mak-

ing, separation of cream, testing milk and cream, and production and care of milk. Object of course to show the value of scientific dairying methods as applied to home and farm conditions. Five hours. Two weeks—July 6-17. Mr. Price.

V Poultry. History of domestic fowls; feeding; diseases and parasites, remedies; breeding; scoring and judging; house fixtures, location, incubators and brooders; feed and care of chicks; killing and dressing poultry. Five hours. Two weeks—July 20-31. Mr. Tyler.

VI Horticulture. Nature studies on the farm. Simple farm and garden lessons. A critical study of a course designed for use with third and fourth reader classes in country and village schools. It consists of thirty stories, each of which illustrates a principle of agriculture. The stories are to be used as reading lessons, and the pupil will be required to make observations and simple experiments, demonstrating the principle illustrated by the story. Accompanying the stories are special instructions for the teacher, outlining in detail a series of observations and practical exercises, with deductions to be made therefrom. The work will include the use of the school garden, and a plan for home gardening by the pupils. Five hours. Six weeks. Prof. Keffer.

VII Agricultural education. Adaptation of agricultural knowledge to public school uses and conditions; relation of agriculture to other common school studies; demonstrations in field and laboratory; adaptation of equipment to resources, environment and grade of school; lessons from the Station Farm; agricultural arithmetic; agricultural literature; the museum; general scheme of agricultural education. Five periods. Six weeks. Prof. Main.

VIII Plant life. A beginner's course in plant form and structure, from seeds and growing plants, with simple experiments. No previous knowledge of botany required. Work adapted to nature study exercises for rural schools and for intermediate grades in city schools. Syllabi and exercises. Excursions. Five hours. Six weeks. Prof. Keffer.

IX Animal life. A general course on animal life, adapted to the needs of beginners and more advanced students, and designated to encourage a deeper interest in the study of the general types of animals, their classification, organization, functions, development, and habits; field and laboratory observation upon the development and habits of common insects, and the general relation of insects, beneficial and destructive, to their surroundings. Five hours. Six weeks. Prof. Morgan.

X Special lectures. (a) Dr. Seaman A. Knapp, three lectures—Agriculture in relation to national prosperity and wealth—June 25, 26 and 27; (b) Dr. Dick J. Crosby, five lectures—Agriculture defined, as a science and art; elementary, secondary, and collegiate; supplementing the text book in agriculture in primary and secondary schools; school agriculture and its relations to the community; boys' and girls' clubs; agriculture as it is taught in some public schools (illustrated with lantern

slides)—July 13-16. Mr. Joseph E. Wing, four lectures—Stories of country life in America and the Old World—July 20-23.

Book Review.

"Rural School Agriculture," by C. W. Davis, Professor of Agriculture, North Georgia Agricultural College. Whether it is possible to win undying fame by writing a laboratory guide in any science is very much to be doubted, which fact may account for the preference for the other route—the writing of a treatise. Who recalls the page and paragraph of his laboratory guide in any science? Yet the experiment, the materials, the manipulation, the successes, and the disasters, are all most vivid recollections to the one who has been through a course of sprouts in a laboratory under the guidance of a good teacher. The writer of the guide must sink out of sight and it is rightly so.

The author shows wisdom in preferring this field of literary effort to that of writing the text for class study which he is well capable of doing. If the 143 exercises provided in this book be completed with full notes and drawings under a competent teacher such note books would themselves be texts of infinitely greater value to the students than any now or to be offered on the book market. But the success of this, as of all laboratory guides, depends so much more upon the teacher than the author that we must give it the label that we give all laboratory guides: 'Oportunity' rather than 'Achievement.' Prof. Davis, unfortunately, cannot provide a teacher to go along with his work as the International Harvester Co. does with its. These inherent difficulties making the success of this work precarious, we hope the author will make some money out of it, and accordingly endorse it as the best all round guide in agriculture for schools that has reached us. But it is going to be difficult to get the average high school "proffessor," (the book is suited to high school grades), to abandon the time-honored practice of teaching a subject from the seat of authority, fortified behind his favorite thumb-worn text, "as it was in the beginning, etc." Illustrations, diagrams, and tables. Cloth, 267 pp. $1.00. Orange Judd Co.

Some believe education is only good for the few who intend to enter professional life, but I believe all should have an opportunity for education. A conception of life should be put behind education that would make one ashamed to be idle. There must be a purpose in education and that purpose be the public weal. The badge of disgrace should be put upon the idler who lives on what others produce instead of what he himself produces. Every young man should pay back to the world what he receives from the world.—[W. J. Bryan to Public School Officers' Association, Nashville, Jan. 22, 1908.]

EDITORIALS.

With this issue the new staff takes control of the Farmer. The arrangement by which the new management assumes control at this time is designed to give them experience in the work under the advice and assistance of the retiring staff and thus enable them to finish the year in full vigor and begin the next volume in October with experience.

Program of the East Tennessee Farmers' Convention and Dedication of the New Agricultural Building, May 27, 28, and 29, 1908.

Wednesday, May 27—9:30. Call to order by President W. T. Roberts, of Chattanooga; address of welcome, Brown Ayres, University of Tennessee; responses, Hon. Jno. Thompson, Commissioner of Agriculture; President's address; appointment of committees.

1:30. "Modern Dairy Interests," R. M. Wasburn, Dairy Commissioner of Missouri; "Tennessee's Dairy Opportunity," B. H. Rawl, Bureau Animal Industry; "The Cow for the General Farm," W. A. Harris, ex-President American Short-Horn Breeders' Association.

7:00. Dairy Symposium and Question Box; (a), "The Record as a Herd Developer," J. J. Burnett, Jefferson City; (b), "Feed in Relation to Milk Production and Profit," W. W. Duncan, Tasso; (c), "The Dairy Cow," unsupplied; (d), "Dairy Management and Dairy Products," R. M. Washburn; "The Tennessee Dairy Association," George Campbell Brown, President, Spring Hill.

Thursday, May 28—9:30. Invocation; opening of Morrill Hall, the new agricultural building of the University of Tennessee; address by Gov. M. R. Patterson, Prof. R. L. Jones, Hon. Jno. Thompson and others; dedicatory address, Dr. Eugene Davenport, University of Illinois.

1:30. "An Educational System for Tennessee," Prof. P. P. Claxton; "Schools for Country Children," Prof. S. A. Mynders; "Education for the Good of the State," Judge N. O. Allen, Athens.

7:00. Farmers' Educational Symposium; address, Prof. R. L. Jones; discussion of agricultural education, led by Superintendent Fred B. Frazier, of Dayton; Superintendent S. M. Foster, of Scott County; Superintendent R. B. Simpson, of Loudon; V. S. Bright, of Hamilton County, and County Vice Presidents.

Friday, May 29—9:30. Invocation; "State and County Fairs," Dr. E. W. Randall, University of Minnesota; "Immigration," Col. M. V. Richards, Southern Railway, Washington.

1:30. "Good Roads," H. H. Brown, Chairman Greene County Pike Commission; reports of committees and convention history, R. K. R. Wallace, Andersonville.

Short Course Prize Contest.

Following are the awards to students of the Short Course of Jan., Feb. and Mar., 1908:

County Prize—**The Tennessee State Fair Association** offers $75.00 for the county having the largest number of students present throughout one full two-weeks' course (Knox County excepted). Davidson Co., Henry Cook, Nashville; C. L. Kendall, Madison; A. M. Stewart, Nashville.

Individual Contests

$20.00 in gold, awarded to the student taking the entire ten-weeks' course who attains the highest average proficiency; given by a friend of agricultural education. E. S. Ezell, Chapel Hill, Marshall Co.

$10.00 in gold, awarded for proficiency in judging light horses; given by Hon. Edward T. Sanford, Washington, D. C. E. S. Ezell.

$10.00 in gold, awarded for the best essay on fertilizers with special reference to the value of potash; given by the German Kali works, New York, N. Y. P. A. Meriwether, R. D. 1, Trenton, Ky. (Montgomery Co., Tenn.)

$10.00 in gold, awarded for the best essay on the value of commercial fertilizers in the building up of poor land; given by the Virginia-Carolina Chemical Co., Atlanta, Ga. R. W. Andrews, R. D. 1, Franklin, Williamson Co.

$10.00 in gold, awarded for proficiency in farm crops and farm management; given by Mr. Wm. S. Myers, New York, N. Y. C. L. Kendall, Madison, Davidson Co.

$10.00 in gold, awarded for proficiency in breeds and breeding; given by Mr. Wm. S. Shields, Knoxville, Tenn. R. W. Andrews.

$10.00 in gold, awarded for proficiency in feeds and feeding; given by Messrs. J. Allen Smith & Co., Knoxville, Tenn. E. L. Stevenson, Elkton, Giles Co.

$10.00 in gold, awarded for proficiency in handling of cream separators; given by the DeLaval Separator Co., New York, N. Y. P. A. Meriwether.

$10.00 in gold, awarded for proficiency in judging beef cattle; given by the East Tennessee Feed Co., Knoxville, Tenn. M. M. Susong, Greeneville, Greene Co.

$5.00 in gold, awarded for proficiency in judging dairy cattle; given by the Hackney Feed Co., Knoxville, Tenn. E. S. Ezell.

$10.00 in bee-keepers' supplies, awarded for the best essay on Why Bee Keeping Should be Encouraged in Tennessee; given by The A. I. Root Company, Medina, Ohio.

1st Ethel Hoskins, New Market, $5.00.
2nd E. S. Ezell, Chapel Hill .... 3.00.
3rd, E. L. Stevenson, Pulaski ..... 2.00.

PERSONAL.

Roscoe Shofner went to Nashville this month to test a number of cows for the Overton Hall farm.

The crops at the farm are in a booming way just now, and every student on the hill should take time to see them.

Baseball is all the talk now, and the ags. expect to get a strong line up and arrange games with the different dormitories on the hill.

The boys are looking forward to summer with a good deal of pleasure, since they intend to show various stunts along the line of scientific agriculture.

Prof. C. A. Keffer spent a few days in Middle Tennessee this month, making arrangements with some of the able orchardists to carry on experimental work for the coming year.

Murphy ('10) has moved out to the farm, and is now making that his headquarters. He has severed his connection with Uncle Sam's agents and is now leading a free and happy life.

Prof. H. A. Morgan made two trips to West Tennessee this month, one to Memphis and Tiptonville, and the other to Covington, at which places he delivered lectures before large numbers, in the interest of the University.

The Agricultural Club has met regularly for the last few times and a good attendance was present. With the aid of Prof. Cotton and others, our constitution and by-laws are in first-class running order now and the prediction is that the club will improve with each meeting.

After several weeks of delay, during which time the flooring for the new Agricultural Building was drying, the work has once more begun, and will continue, no doubt, till it is finished, probably sometime in June. Let every agricultural student put his shoulder to the wheel, and do everything in his power to help the work along. Our new building will soon be ready for use, and we should start out with renewed energy and enthusiasm.

CONTENTS—MAY, 1908

Subscriptions, 50 cents per session—9 numbers, 10 cents a copy, to be paid in advance.

Contributions from members of the Club and from the Alumni of the Agricultural Department are especially requested.

Following are our advertising rates:
1 page, per year, $40.00; per issue, $5.00
½ page, per year, 25.00; per issue, 3.00
1-3 page, per year, 20.00; per issue, 2.25
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U. T. FARMER, University of Tennessee, Knoxville, Tenn.

AGRICULTURE IN THE HIGH SCHOOL.

DR. EUGENE HOWARD.

The American High school is a new institution. It has arisen from our determination to make education truly universal. Now, universal education means that all the people shall be educated, and in such a way that all the activities necessary to a highly civilized race may develop and go forward. Only a small per cent of the people will ever go to college and the experiment of universal education will be tried out in the field of the secondary schools.

The problem of secondary education is very largely the problem of the fourteen-year-old, and we should never rest easy till every farmer's boy and girl may go to the nearest high school, and there find instruction not only in agriculture but in other industries and professions which concern the community, and after having lived the day in an atmosphere broader than their own studies go home again at night to dream of what a great thing the world is and to wake with an intelligent appreciation of the place in it which they propose to occupy.

If the existing high schools cannot or will not serve the interests of agriculture and her people, then just as certain as the sun rises and sets, a system of schools will be founded that will do it. The farmers of this country are bent on good secondary education that will fit for country life, and if they are obliged to found a new system of schools to get it, then they will do that and insist upon a fair division of the revenue.

I am not arguing that the high schools in their present condition are doing, or are able to do, what is needed for agriculture. My contention is that they can get ready to do it, and that right speedily; and that if they will proceed to get ready, they should have the chance, for it is their opportunity and their privilege; and if they do not propose to serve agriculture and her people as faithfully and as well as they are serving or intend to serve other interests, then they should be compelled to do it. That is my thesis in a few words; but my conviction is that they are for the most part fully ready to turn both their brains and their tremendous efficiency loose on our problem if we will let them.

THE U. T. FARMER

Vol. 2. MAY, 1908 No. 8

FEED AND ITS RELATION TO MILK PRODUCTION AND PROFIT.

(D. W. DUNCAN, Tasso, Tenn., Short Course, '07.)

Mr. Chairman, Ladies and Gentlemen:

I am deeply sensible of the honor done me in my being asked to talk to you to-night on a subject that possibly a great many of you know more about than I, myself, know. There are Gettys, Mattock, the Youngs, Lenoir and Cannon who were experienced dairymen before I ever thought of the dairy business as a paying proposition; and I have heard Gettys say that he sold $30,000.00 worth af butter to ONE customer, and $11,000.00 to another—and, mind you, they are only two of his customers.

I feel that I should be perfectly safe in saying that the feeding of a dairy herd of cows for profit emphasizes the fact that it is the individual cow, as a unit, with which we shall have to reckon; and unless you have, by the right kind of methods of breeding, selecting, and weeding out the "robber" cows, or boarders, in your individual herd, brought the average annual yield per cow up to, say 5,000 pound of milk, it matters not what kind of feed you have at your disposal, your margin of profit will be exceedingly small.

The cow that does not pay for her board and lodging is a "robber" cow. There are robber cows in many herds. Do you know with any degree of certainty that there are none in your herd? A cow must produce not less than 5,000 pounds of milk in twelve months to be a profitable cow. If the average of your herd is not more than this, some of its members are robbers, and they should be sent to the butcher. Keep a record of each cow's production, and then, and only then, will you know which cows are paying a profit for the feed they are consuming.

From my own personal experience, it seems to me that we East Tennessee dairymen are depending too much on the cotton-seed oil mills and commercial feeding stuffs for rations for our dairy cows, to the neglect of that which can be more profitably produced on the farm, and by this means add very materially to the cheapening of the production of our dairy products. Take, for instance, a ton of cotton-seed meal, which will cost, F. O. B. Tasso, $26.50. In that ton of meal, there are, approximately, 750 pounds of protein and 338 pounds of car-

bo-hydrates. Our Experiment Station here, on one acre of ground, has produced 26 bushels of soy beans (equal to 1,560 pounds) and 2½ tons of soy bean stover. The 1,560 pounds of soy beans carry 461 pounds of protein and 348 pounds of carbo-hydrates; the 5,000 pounds of soy bean stover carry 115 pounds of protein and 2,000 pounds of carbo-hydrates; a total of 576 pounds of protein and 2,348 pounds of carbo-hydrates produced on one acre, against 750 pounds of protein and 338 pounds of carbo-hydrates in the ton of cotton-seed meal. The ton of cotton-seed meal costs from $25.00 to $30.00 per ton, according to location; do a little figuring, yourselves, and tell me what the acre of soy beans will cost you to produce.

Gentlemen, the digestible nutrients in these different feeding stuffs are what we have to reckon with! I know some dairymen down in Bradley county who say that they can buy cotton-seed hulls and feed them cheaper than they can grow corn silage. In one ton of cotton-seed hulls, there are 60 pounds of protein and 662 pounds of carbo-hydrates; in one ton of corn silage, there are 180 pounds of protein and 226 pounds of carbo-hydrates. The ton of cotton-seed hulls will cost from $8.00 to $10.00. Now, do a little more figuring and tell me what it will cost you to produce a ton of corn silage.

Feed and its relation to milk-production and profit will not cut much figure with you unless you have, by the right kind of methods of breeding and selecting, developed a dairy cow which is capable of high production, and then know enough of the science of feeding to give each part of a ration its own nutritive value, and by the growing of the greatest amount of feeds on the farm—such as silage, cow peas, soy beans, alfalfa (if you can grow it), clover, the vetches—and by getting your head into the game of dairying, studying the temperament of your individual cows, learning their requirements for a maintenance ration per thousand pounds of live weight, and learning what their requirements will be to produce twenty pounds of milk, or one pound of butter fat per day, and, by proper feeds and feeding maintain that average production for a period of 300 or 320 days, then the question of feed and its relation to milk-production and profit will mean a great deal to you.

No matter how carefully a ration may be compounded with reference to the balance of nutrients, it will not prove an economical one unless it is supplied in a quantity that will meet the full requirements of the animal for which it is prepared. For an illustration, take your farm boiler. You can fire that boiler to generate just enough steam to pump water and maintain its water supply; but if you want it to generate steam enough to saw wood or cut silage, you will have to increase

your fuel to meet the requirements. This applies with equal force to the feeding of the dairy cow or the beef steer. You can feed a ration that will only maintain poor live weight; but if you want to produce a pound of butter fat or a pound of beef per day, you will have to feed a ration properly balanced to meet those requirements for economical production.

Another very important question is that of prices of dairy products. A very prominent East Tennessee dairyman says that we may not be able to maintain our prices for dairy products under present conditions, and the only way that we should be able to meet a condition of that kind would be to reduce the cost of production by growing more of our feeds on the farm, and increasing the yield per cow.

Consider $40.00 the average cost of maintaining a cow for twelve months. If she produces only 300 gallons of milk per year, her feed cost would be 13⅓c. per gallon;

400	gallons	per	year	would	be	10c.	per	gallon.
500	"	"	"	"	"	8c.	"	"
600	"	"	"	"	"	6⅔c.	"	"
700	"	"	"	"	"	5 5-7c.	"	"

You will readily see the great difference in the cost of production and profit between the 300-gallon cow and the 700-gallon cow. What is the average of your herd, Mr. Dairyman, 300, 500, or 700 gallons of milk per cow per year? The 300-gallon cow may stand alongside the 700-gallon cow. She requires as much space. She demands as much attention. She consumes veary nearly as much food. And, still, every day that she stands there she sponges on that grand, little cow that is capable of producing 700 gallons of milk per year at a feed cost of 5½c. per gallon.

Allow me to call your attention to a herd of dairy cows that came under my observation during the last year. The average yield of eighteen of those cows was 6,360 pounds of milk and 323 pounds of butterfat for the twelve months. The average cost of the feed for those eighteen cows was, approximately, $35.00 per cow per annum. The best cow of the eighteen produced 8,087 pounds of milk and 411 pounds of butterfat, at a feed cost of $36.96. The lowest cow in milk-production produced 4,894 pounds of milk and 283 pounds of butterfat, at a feed cost of $32.43. The lowest cow in butterfat production produced 5,167 pounds of milk and 260 pounds of butterfat, at a feed cost of $32.45. Now, there were two other cows in that herd that need mentioning. One of those two cows, in four months, produced 775 pounds of milk and 40 pounds of butterfat, at a feed cost of $8.42, while

the other one produced 1,278 pounds of milk and 61 pounds of butter-fat at a feed cost of $10.48; but, having demonstrated their utter lack of dairy performance, they were unceremoniously sent to the butcher, where all robber cows should be sent as soon as they are detected.

Quoting from "Hoard's Dairyman": "Investigations in the results of Danish dairying show that their cows produce three times as much butter per cow as do the cows of Minnesota. How do they do it? First, very largely, by breeding true to type, and only to the best dairy bulls they can get; second, by being liberal feeders. What's to hinder the American farmer from doing just as well? Nothing, save his lack of dairy intelligence. When the American farmer gets over his foolish notion of prejudice against learning from books and papers, and learns that this great dairy question is, first of all, a matter of mental intelligence—brains first, and hands next—he will then be prepared to do what the Danish farmers are doing, and do it just as well. But so long as a farmer does not believe that reading and studying—in short, intelligence—are necessary to success in dairying, he will not do as the most successful people are doing in his line, and as a consequence, neither will he make as large a profit.

"The Danes have their guilds for the teaching of agriculture and dairying, which they attend in large numbers, familiarizing themselves on the problems of their soil, their crops, and their feeding rations, and it is no donbt due, to a great extent, to the knowledge thus gained that they are enabled to produce three times the butter fat per cow that the Minnesota dairyman produces, which emphasizes the fact that, after all, it is the amount of intelligence you put into it—brains first, and hands next."

The comparison between Denmark and Minnesota applies with equal force to Tennessee. Denmark has her agricultural guilds; Minnesota and Tennessee have their agricultural colleges, where, in addition to their regular courses in agriculture, they teach every winter a farmer's school, or a special short course for the benefit of the farmers and dairymen of the states, respectively. Now, gentlemen, are we East Tennessee farmers and dairymen giving our Farmers' School, or Short Course, as taught every winter by our State University, the consideration that it merits? Are we really alive to its great importance and its influence on improved agricultural and dairying conditions of our section of the State? It seems to me that we are not. In proof of which, I want to make a few comparisons:

I shall take, for instance, the State of Wisconsin, which teaches at her University every winter a farmer's school along the same lines as the one taught in Tennessee. In Tennessee in 1904, the attendance at the Short Course was 23; in Wisconsin, 477; in 1905 Wisconsin had 452; Tennessee,

19. In 1906, Wisconsin had 489; Tennessee, 14. In 1907, Wisconsin had over 500, while Tennessee, under Professor Morgan, jumped up to a total of 63. And the same conditions exist in Illinois, Iowa, Ohio, New York, and in all those other states where the farmer is trying to get the greatest possible results from the soil. We have just as good a school as Wisconsin, or Illinois; we have just as good a corps of instructors. A better knowledge of agriculture, of feeds and feeding, a better knowledge of up-to-date methods of dairying, is just as important to the East Tennessee farmer and dairyman as it is to the one in Wisconsin or Illinois. And, still, the Wisconsin and Illinois dairymen are setting the prices of dairy products and competing with us in our own markets.

Butter is shipped in car lots from Wisconsin, through Tennessee, to Atlanta, there to be distributed locally to all parts of the South. Quantities of this butter is shipped back to Chattanooga, by express, there to be used in the leading hotels, and to be sold in competition with East Tennessee butter.

Sweet cream is shipped from East St. Louis and Chicago in quantities to Chattanooga, there to come in direct competition with East Tennessee dairy products. Could the fact, do you think, that hundreds and hundred' of farmers and dairymen in Wisconsin, Iowa, and Illinois attend a farmers school, or dairy short course, where they learn all the short cuts in modern dairy methods, where they learn how to properly balance a ration for a dairy cow, where they learn to give each part of a ration its own nutritive value—in fact, learn that it is "brains first and hands next"—have anything to do with this? If so, we East Tennessee dairymen had better begin to get interested in our own dairy school that is taught every winter by our State University.

Every up-to-date dairyman in this state should co-operate, through Prof. S. C. Barnes, with the Dairy Division at Washington, D. C., in their efforts to improve the dairy interests of Tennessee. Professor Barnes will visit your dairy, and instruct you in feeds and feeding and the modern methods of dairying. And credit is due Professor Barnes for some fine records; by the way, records which were a revelation to their owners. Try modern methods for twelve months, and you will be surprised at the results. And unless you do try modern methods, by getting your head into the game, increasing the aggregate yield per cow with a corresponding decrease in the price of feed stuffs, by growing more of poor feeds on the farm, tell me how we shall be able to meet an era of lower prices if they are forced upon us?

Gentlemen, there is another very important question that confronts us today, and that is the question of rural agricultural education for the farmer's boy. The credit is due our most estimable Commissioner of Agriculture, the Hon. John Thompson, if you please, in bringing the farmer's attention, in every farmers' institute that has been held in this state, to the

great importance of agricultural education's being taught in the rural schools of the state. Colonel Thompson realizes that it is the farmer of tomorrow—the farmer's son of today—and that he must be an educated farmer from an agricultural standpoint who is to put this fair state of ours in the commanding position which she should hold among her sister states of the South, as an agricultural and live stock state.

Take the State of Georgia, if you please, with her State University at Athens and eleven agricultural colleges, one in each Congressional District of the State, and an appropriation of $250,000.00 per year for their maintenance—and we had the hardest kind of a fight to get an appropriation of $100,000.00 for our State University—an appropriation which made possible the Agricultural Building which is to be dedicated tomorrow; an appropriation, $40,000,00 of which was set aside for an Experiment Station in West Tennessee; an appropriation which provides for county co-operative experiment work in Middle Tennessee.

Now, you can assist in this work just as you make yourself forceful. I care not what your politics, but make your candidates for the legislature declare themselves and send only men to the next legislature whose sympathies are in thorough accord with the agricultural, educational and live stock interests of the state; men who will give us an appropriation for our State University and Experiment Station which will place them in the front ranks among their sister states of the South; men who will help to hold up the hands of our Commissioner of Agriculture in his efforts in behalf of agricultural and educational development of the state.

Just think of the condition in which we should be were every man on the farm a keen interpreter of the problems of his soil, his crops, his feeding rations, and a sincere believer in his profession! Rural agricultural education has this to accomplish, and it is by the intelligent efforts of you men who stand for better agriculture, better live stock, and better methods, and the fruits thereof, that this will be done.

I thank you for your attention.

OBSERVATIONS ON THE FRUIT FARM.

The soil of the University fruit farm is in as fine a condition as could be wished. It is clean of weeds and as loose as an ash heap, just the condition to take up the most water and retain it from passing out except through the trees. The style of cultivation is what is known as the California method, namely: to plow the soil in the early spring and continue cultivation every time a crust forms, up till August, when the cover crop is sown, which extends over winter and is plowed under in the spring. The crop of fruit promises to be good this spring. However, some trees down on the lower parts of the hill have light

crops, due to the heavy frost. This seems rather strange at first, as the trees with scarcely any fruit are not over a hundred feet away from and not over thirty feet below those heavily laden, but it shows the marked difference in frost action at different altitudes. Some of the trees on top of the hill which were in full bloom during the freeze lost most of their fruit, while those which had already formed fruit were scarcely injured.

Just at present the peaches are being thinned. Now is the proper time as the "drop" is about complete and the seed have not been formed. Small boys do the work. They go over every branch of the trees, leaving a peach every four or six inches. The cost is about twenty-five cents per tree, and while it will not increase the yield, yet the superior quality of the fruit makes it well worth while in small orchards. In large commercial orchards a man could not afford to pay out a thousand or so dollars in advance on his peach crop, so he must do his thinning by pruning. He must cut back every branch, when he prunes, to a length sufficient to prevent its bearing more fruit than it can mature properly.

It is interesting to note the effect of pruning on the peach. The trees are all pruned to secure an open crown, thus allowing light to reach the entire length of every limb; and on the limbs of the trees with the most open crown the fruiting wood comes out all the way down to the trunk, thus producing much of the fruit close to the ground. This desirable growth of low fruiting wood may be kept up from year to year by pruning each year's growth back. One of the most interesting effects of pruning is to note how heavy pruning checks immediate fruiting, while light pruning favors it. The trees which were extremely heavy pruned bear almost no fruit this year, while those which received lightest pruning bear a heavy crop. However, the heavy pruning causes a much greater growth of wood. W. M. LANDESS, '10.

THE VALUE OF THE STUDY OF ZOOLOGY IN EXTERMINATING PARASITES AND DISEASE GERMS.

When we consider the fact that all of the parasites and at least one-half of the disease germs that ravage the bodies of men and cattle belong to the animal kingdom, we can realize how important it is to know the habits and life histories of these little pests. The study of the effect of certain drugs on these animals is very helpful to their suppression, but in many cases they get such a hold on the body and multiply so rapidly that the medicines are rendered useless. However,

when we know what the stages of development are, we will find out in what stage the germ or parasite is weakest and so when that stage is reached we can strike a blow that our little enemies cannot resist.

On the other hand, many of the animalcules have two or more hosts; that is, they pass through one stage of development in one animal, and then pass into another for the next stage. Thus it is possible to kill the secondary host when the parasite is in it and so keep the parasite out of man. Again, there are often certain conditions of environment necessary to one or more stages of the life history; and so, when this environment is removed, the pest is killed.

Only in late years has the study of zoology in connection with the suppression of disease been conducted. Nevertheless, in these few years some of the most deadly enemies of men and cattle have been put under control, if not entirely exterminated. Let us consider briefly a few of these diseases. In the first place, the germ of the common disease of malaria passes through many complicated processes in its life history, part of which take place in the mosquito, which is the secondary host. It is also certain that the injection of the germs by the mosquito was the only means of infection and there was only one kind of mosquito that could carry the germ. Immediately the authorities began a war on that mosquito and the conditions that favored its life with a result that is evident to all sufferers of malaria. Yellow fever is carried in the same way by a different kind of mosquito. This once very prevalent and fatal disease is now being practically exterminated. During the Spanish-American war many soldiers died of yellow fever in Cuba, so the United States authorities took charge, with the result that a few weeks ago, just ten years after Dewey's exploit in Manilla bay, there is not a single case of yellow fever reported by the United States officials in Cuba.

Texas or bovine fever, which is carried by a certain kind of tick, is being rapidly killed out in practically the same way.

The larger parasites, such as the tape-worm and trichina are transmitted in a little different way. The secondary host of the tape-worm is beef, and that of the trichina, pork. These parasites are taken into the system by eating these two meats. The way to prevent them from entering the body is to have meat inspectors to throw out all infected meat and to cook thoroughly all meat that is eaten. There are some parasites that do not occur in man. An example of these is the liver fluke, which kills many sheep each year. It, too, is controlled by a knowledge of its life history. In conclusion, we see that since so many germs and parasites are animal, and since the diseases that they cause are controlled by a knowledge of the life history of these animals, therefore the study of zoology is necessary to and forms a foundation for the uccessful practice of medicine.

D. W. ATCHLEY, '11.

WHY BEE-KEEPING SHOULD BE ENCOURAGED IN TENNESSEE.

There are several good reasons why bee-keeping should be encouraged in Tennessee. First, we have an ideal climate for this kind of work, as our winters are not cold enough to require extra care and protection for the bees. Therefore it is easier to keep bees here than in some of the states farther north. Again, the farmers of the state practice a varied rotation of crops that are available for honey production. Among these are the clovers, cowpeas, cotton, buckwheat, and a great many others. As these have other uses besides honey, they are doubly valuable. It will not pay to raise crops for honey alone, but as a by-product it is of considerable value.

We also have a great many wild flowers and plants that furnish nectar and pollen. Tennessee has extensive forests in which are found many honey-producing trees. Some of these are bass wood or linn, sourwood, chestnut, spruce, poplar and some of the willows.

Bees are very necessary in farming, gardening and fruit growing, as they are an important factor in the fertilization of all kinds of plant life. There are a great many kinds of plants that depend almost entirely on bees and other insects to scatter their pollen. It is said that crimson clover will not seed unless pollenized by bumble-bees.

All kinds of fruits are aided in their development by honey bees. Experiments have shown that where fruit growing is attempted without bees of any kind there will be scarcely any fruit. A great many fruit growers say they cannot raise fruit without bees. Bee-keeping is as important in other branches of agriculture as in fruit growing.

Honey has considerable fruit value and is used in cooking to a great extent. A pound of honey is equal to a pound of butter in food properties, and is generally cheaper. It is more healthful than cane sugar. A vast amount of honey is used each year by bakers and confectioners. Cakes made with honey will keep longer than when made with sugar. It is also much used in making cough medicines and salves. For candy making it is more wholesome than cane sugar.

Wax is used for a great many different purposes. Dentists, sculptors and painters use it, and it is also used in making candles, medicines and floor finishes. It is therefore very valuable.

As these products—honey and wax—are produced almost entirely free of cost, it can readily be seen that they can be made a source of profit to any one caring to undertake this line of work.

The children and young folks of the state should be interested in the study of bees and their keeping. There is no study more fascinating than this, and much pleasure, as well as profit, can be derived from it.

It can be seen that bees are natural friends of, and co-partners with, the farmers of any locality. Therefore their keeping should be encouraged in the state.

ETHEL HOSKINS,
New Market, Tenn., Short Course, '08.

A FORESTRY TRIP.

On Friday afternoon, May 22nd, Prof. Keffer, accompanied by three members of his Forestry Class, Shofner, Work and Thetford, left the Southern depot, en route for the Smoky Mountains to spend a few days looking into the methods of logging and milling. We arrived about 4:30 o'clock at a little station called Walland, where we changed cars. As we had to wait about an hour at this point, we went through the large Tannery which is situated at Walland. About 5:30 we boarded the fast express for Townsend, consisting of one passenger coach, several flat cars and box cars. Although the distance was only about 10 miles, we spent one hour on the road. In Townsend we found one of the largest and most up-to-date lumber mils in East Tennessee. We arrived here in time for supper, and after registering at the largest hotel, we went up Little river about three-fourths of a mile, where we found a nice bathing pool. After we had enjoyed a fine swim we went back to the hotel for the night.

The next morning we arose at 4 o'clock to catch the logging train which was going about eleven miles farther up into the mountains. The train took a very crooked course, up the east prong of Little river, following the river bed all the way, and as it did not go at a very fast rate of speed, we had the opportunity of enjoying all the beautiful mountain scenery. We arrived at the end of the road about 8 o clock, and leaving our camping outfit at one of the logging camps, we proceeded farther into the mountains. There we studied the method of lumbering, the habit of growth of the various species of trees, both hardwood and coniferous, the undergrowth and expense of getting the logs. We continued this all morning, and about noon arrived at one of the various construction camps, where we satisfied, to some extent, our very great hunger. Our dinner was not served in courses, but as may be expected consisted of such things as a hard-working mountaineer would most greatly relish, as beans, peas, corn bread, canned corn, tomatoes, etc.

The afternoon was spent in about the same manner as the forenoon, except that we took several invigorating swims in the cool, clear mountain streams. Late in the afternoon a rain came up and we were forced to seek for shelter. That night we caught a logging train and went back to camp, where we enjoyed a little rest, talked over the events of the day, and finally turned in for a little sleep. The next morning we decided we had better return to our studies, so we took the express for Walland. There we boarded the Knoxville and Augusta train, and arrived in Knoxville in time to go to church on Sunday morning.

A. W. SHOFNER, '09.

AGRICULTURAL EDUCATIO. .

A LETTER FROM PRESIDENT ROBERTS.

Some time ago the chairman of the Association for the promotion of the Teaching of Agriculture in the Public Schools sent letters to the members of the Association requesting reports concerning their work and plans in regard to the teaching of Agriculture.

The replies received from these letters show a marvelous enthusiasm, and everyone speaks in the highest terms of the work in the agricultural classes of the Summer School. A great many of these teachers are visiting institutes and urging the cause of agriculture, while almost all are doing some agricultural work in their schools. Following are extracts from a few of these letters:

"I think you people [U. of T.] are doing a great work, and feel that the sooner our farmers and teachers become interested, the better it will be for our farms as well as our county schools."

"I am making some talks on agriculture in this county. * * * I find that the people can be interested."

"We are trying a few simple experiments in class and are very much interested in them. * * * I hope to belong to the agricultural class of the Summer School next summer."

"You [U. of T.] are doing a noble work long needed."

"Have received copy of the U. T. FARMER. Find it very helpful in my school work. Also put it in reach of some farmers."

"Agriculture is the center of attraction in my school and my class is wild with enthusiasm."

We are glad to see this wholesome influence for which great credit is due the Summer School. Beyond question these teachers have touched the lives of their pupils in a way that will result in untold good.

Too long have we had an education that takes the children away from the farm and sends them to the overcrowded city to engage in the trades, leaving country life and the production of the food supply to take care of themselves. Too long have we been giving the child knowledge that will either take him away from the world in which he has been reared or be of little service to him if he remains.

Children are trained in the school to be preachers, lawyers, doctors, bookkeepers, and stenographers; but never have the schools provided for educating the farmer. No wonder our boys tell us they mean to be farmers and therefore do not need to go to school. No wonder we have a hard time persuading them that an education will be of as much service to them as if they meant to be teachers or lawyers.

We wish it understood, however, that we are not unmindful of the great good that the public school has done and is doing today. We do not object to any one of the many good things that are taught in the school. We only urge that so large and productive a class as our farmers are entitled to something that will more directly assist them in their chosen walk of life.

Now, my fellow rural teacher, no one has such rare opportunities of promoting the physical comfort and well-being of his pupils, touching their young hearts and lives, as we. Everything from the mystery of the butterfly and the sprouting of the corn to the beautiful green of the hills can be made to influence the young minds we are called to train. Then let us see to it that they get the most of that which will directly aid them in appreciating the beauties of nature and in earning their daily bread. JAS. A. ROBERTS.

AGRICULTURE IN THE COUNTY HIGH SCHOOL.

NO policy of agricultural education is worth while that does not contemplate a practicable, permanent, self-perpetuating system. Assuming what is undoubtedly true, that the State Agricultural College cannot go to any considerable number of school districts of the State in its extension work and that relatively few of the teachers of the State can come to the University, some system must be devised by which University and rural teacher may get together. The county high school is ideal in its fitness for this purpose. These schools, under the direct supervision of the county superintendent, who licenses all the rural teachers of his county, are the best means of preparation available to the great body of teachers. Such school with an agricultural course and a plot system in the hands of an instructor trained at the Agricultural College should be the ideal of every county. And perhaps its greatest good will be done through the teachers of rural schools who come to it for training.

What the course of study in agriculture for such a school should be is a matter neither vague nor difficult to prescribe. In this science more than perhaps any other it is true that a course for any grade in or below the high school includes everything found in the course of any preceding grade. And until some knowledge of botany, zoology and chemistry is acquired the materials used and the course of study followed must depend more or less closely on the order in which the succession of seasons brings various crops, animals and

occupations to their maximum interest in the farm home. And these influences will dictate, in a certain measure, the course in the high school. But whatever the high school course may be, it must be subject to revision to accommodate it to the better preparation of pupils, which will come from teaching agriculture in the elementary grades. One having the good of the cause at heart must have too much respect for the science to recommend for any school a grade of work for which the teacher is unprepared. When teachers realize the opportunities for remunerative work that this new field offers doubtless we will have such numbers taking university work in agriculture as to make a large class in agricultural pedagogy. And when enough competent teachers are ready for high school positions no county high school board, having the financial means, can be excused for omitting agriculture from its high school courses.

WORK OF AN AGRICULTURAL HIGH SCHOOL.

V. S. Bright, '07.

The programme committee made an error in placing a man of so limited experience on a programme to speak on a subject that should receive the most careful thought of men of more mature years. The question of secondary agriculture has at last passed the theoretical stage; it is now in the experimental stage; also, it is now passing over a period that every step should be measured, for if the teacher makes an error in a community the cause of agriculture will suffer accordingly. I cannot say definitely what the work of the agricultural high school should be in the State of Tennessee on account of Tennessee having such a varied agricultural system, but I believe it should in all cases conform to the local conditions. I can only suggest a few things and tell you what the Tyner High School is doing and is planning to do.

First, the work of the high school should not be experimental in character, but demonstrative. We have experiment stations to do the experimental work for us, but there should exist between the experiment station and the agricultural high school a common interest. The agricultural high school teacher should co-operate with the experiment stati n staff and agricultural college and by a united effort try to solve and work out the problem of secondary agriculture in any given locality.

The Tyner High School has adopted a standard four year rotation that can be maintained at a minimum cost. The rotation that has been adopted requires four-fifths of an acre of land. Not only will a rotation

be maintained on said four-fifths of an acre, but a fertilizer and green manure demonstration will also be exhibited. The standard rotation that I speak of is the general corn, wheat and grass rotation. In addition to the rotation we are preparing to grow one-half acre of alfalfa and about one acre of soy beans and peas each year for hay, followed by rye and vetch or crimson clover, to be turned under as a green manure crop. On account of the high school being located near a city where a great deal of trucking is carried on in a very unbusiness-like and unsatisfactory way the institution just spoken of maintained a hot bed during the worst winter months from which was harvested two crops and the third crop is now growing. The first crop was:

First:	Crop of lettuce at 10c per head	$27.00
Second:	Crop of tomato plants at 10c per dozen	4.80
Third:	Crop of onion sets	1.50
		$33.30

If onion sets are worth what they generally are in the spring the value of the crops from an ordinary hot bed I sold from will be $33.30. The writer can easily count on one bushel of onion sets.

There is a great deal of ridge land in Hamilton county, and especially around the location of the high school. There are at present growing on these ridges, orchards varying from a few trees to twenty acres. I have been told that some of these orchards haven't failed bearing a crop in ten years; even last year (1907) there was some fruit in them. The farmers who own these orchards do not know anything about orchard management—scarcely as to orchard crops, spraying for insects or spraying for fungi. There is only one spray pump within five miles of Tyner and it was used to whitewash a barn. Hamilton county is infested with San Jose scale and we have plenty of it around Tyner. Some of the farmers in my vicinity have lost heavily in the last two years on account of San Jose scale. One of the patrons of the school, who had 600 four-year-old trees, last year lost fifty, and if he doesn't spray he won't have a single tree in two years. In order to help such farmers fight the insect pests and fungous diseases intelligently the school has planted a small orchard of thirty peach trees and twelve apple trees.

On the school lot is a rough stony plot of land that will be planted in a forest to show the school boys and neighboring farmers how easy it would be to grow fence posts.

The average kitchen garden on the farm contains generally the following vegetables: peas, onions, a few cabbage, beans, beets, rad-

ishes, turnips and potatoes. Now let's see how much we can enlarge the list of things that can be grown that command high prices and are good to eat. The high school in which I am teacher of agriculture expects to add to the former list the following garden plants to demonstrate that they can be grown in my locality: asparagus, rhubarb, spinach, lettuce, cauliflower, kale, egg plant, okra and parsnips. At a glance you can easily see that the lists can be twice as large and can usually be grown on the same acreage the former list was, on account of the general kitchen garden lying out and being allowed to grow up to weeds.

The most important work the school is preparing to attempt this coming school year is the feeding of some beef animals. We are preparing to feed five beef animals to demonstrate to the boys and girls and farmers as well, that the best method of marketing a surplus of farm crops is through some kind of animal. We don't expect to make any gain over the cost of the feed and steers. The manure will more than pay for the cost of feeding and I have sold my surplus feed and roughage through a steer that could not be marketed any other way. Every farmer knows what a ton of barnyard manure will do, but he doesn't know the value of it. How does the farmer around Tyner do now when he has a surplus of any farm crop? Answer: He puts it in a wagon and carries it to Chattanooga, and then in the spring he buys ready-mixed fertilizer at $25.00 per ton. In addition to the feeding demonstration we will care for the manure so as to get the best possible results when it is put on the land. This is merely what we are doing and attempting to do, and if it is of any value or suggests anything to you as a teacher, or if it will help to enlist the sympathies and efforts of the farmers that live in other counties, or county schools of a similar character, my attempt will not be in vain.

The question now arises, what does the high school student learn from all I have been telling you? I think that every student that enters the school, boys and girls alike, should have every point in the rotation explained to them in its proper place; they should be allowed to prune the orchard under the direction of the teacher; they should be given object lessons when the crops are growing in the orchard as to kind and disposal; they should be allowed to feed a balanced ration to the animals; the students should be given object lessons in the caring for the manure. Now there are hundreds of object lessons that can be given with plants in the field and garden that cannot be given any other way. There are teachers who complain and say that they have not time to do any of this work. I will say that the teachers of agri-

culture must be ready and willing to put on overalls and plow, hoe, feed, or do anything else that has to be done, as the case demands him. If he will do it the students no longer think that he is preaching a doctrine that he is not willing to adhere to himself in practice.

As to agriculture being taught in our common schools, I am heartily in favor of this. T. B. CARR, Cumberland Gap, Tenn.

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I think the movement to teach agriculture in our common schools a wise one, and I hope it will succeed. J. C. T., Jonesboro, Tenn.

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I believe agriculture should be taught in rural schools, and city schools as well, because society receives its best lesson from the frugal tiller of the soil, and all mankind is benefited by a knowledge of its culture. C. H., High Point, N. C.

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I regard the scheme to teach agriculture in our rural schools as practical. The failure to do so is out of the question any longer. It seems that we have been asleep to our welfare. We have to educate our farmers' children or they cannot have an equal opportunity with their fellows. JOHN W CATE.

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I regard the teaching of agriculture in the common schools as a good thing, for the reason that such a large number of the students who are engaged in agricultural work have absolutely no training and no idea of plant food, rotation of crops, etc., etc. I think it practicable and deem it an important matter. That, together with personal and private economy, are two great things that should be taught, especially to the common people. D. C. YOUNG, Sweetwater, Tenn.

[From Tennessee Valley Farmer.]

PERSONAL.

Several short course men, Frazier, Koger and others, were here during the Farmers' Convention.

Prof. Keffer and his class of Juniors have just retnrned from a trip to the mountains where they spent a few days studying forest conditions. They report a most delightful trip.

The members of the Agricultural Club were given a pleasant treat at a recent meeting, consisting of strawberries and ice cream. To say that it was enjoyed would be speaking too lightly. Prof. Keffer is always to be found ready to do anything to add to the pleasure of the students.

L. R. Neel, '07, was on the Hill during the East Tennessee Farmers' Convention and was welcomed by all who had known him when on the Hill and knew of his sterling qualities and ability as a student. Mr. Neel has been engaged in farming during the past year and wears a very prosperous look.

Notwithstanding the fact that the Agricultural team [illegible] in getting in shape, when it did it enjoyed a most extraordinary though brief season pf glory, never having met with a single defeat. By the end of the season they were in great demand and it is to be regretted that they could not schedule games with all the aggregations; but as it is, they have a just claim to the championship of the Hill.

The last meeting of the Agricultural Club for the year was held Monday night, May 25, for the purpose of electing officers. The following men were elected: W. M. Landess, president; A. Peery, vice-president; A. W. Shofner, secretary-treasurer; R. M. Murphy, critic. The club has just completed the best year in its history and is looking forward to a much greater ffeld of usefulness when established in the new club room in Morrill Hall.

Judging from the number of transfers in the American Berkshire Association, Russwurm has been as active in selling Berkshires as he has been in disposing of thoroughbred horses; he having recently sold the splendid boar Premier Lee of Needmore, to W. H. Phillips, Simpsonville, Tenn.; Sophia of Needmore to E. W. Oglesby, Lafayette, Tenn.; Zal of Needmore, to Wm. Gerst, Nashville, Tenn.; Alvaton of Needmore, to Wm. Pope, of Alvaton, Ky.; Model Longfellow of Needmore, to Lindsley M. Keasbey, Austin, Texas.

J. W. Russwurm, breeder of thoroughbred horses and Berkshire hogs, has sold the unnamed chestnut filly, yearling, by Imp. Ornus, dam Allie C. (dam of Sidney Lucas, winner of the American derby) to J. M. Johnson of Oakland, Cal. This youngster is pronounced by competent judges, as the best filly that has been raised in Tennessee for many years. She is engaged in both the Futurity and Great Brood Mare stakes. Mr. Russwurm also sold the brood mare Irksome, by Iroquois, dam Hilda, by Great Tom, to John Walters of Detroit, Mich.; and to Albert Watkins & Co. the three year old filly Odalie, by Phoenix, dam Merle, by Tammany.

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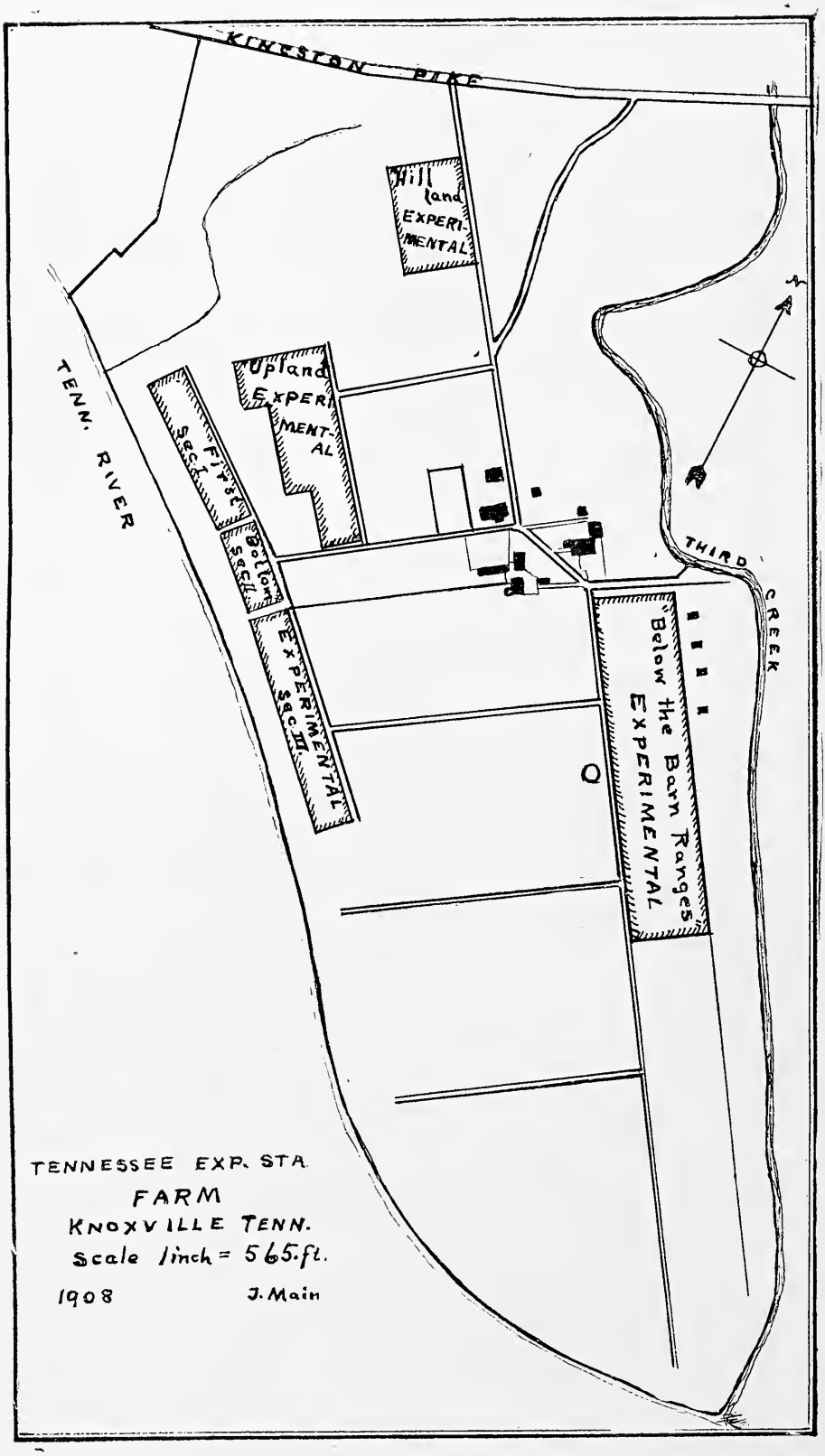

KINGSTON PIKE
Hill land EXPERI-MENTAL
Upland EXPERI-MENTAL
TENN. RIVER
First Sec I
Bottom Sec I
EXPERIMENTAL Sec II
THIRD CREEK
Below the Barn Ranges EXPERIMENTAL
TENNESSEE EXP. STA.
FARM
KNOXVILLE TENN.
Scale 1 inch = 565 ft.
1908
J. Main

THE U. T. FARMER

Vol. 2. JUNE, 1908 No. 9

BERMUDA GRASS.

Bermuda grass, *Cynodon Dactylon,* is grown mostly in the Southern States and is of very little value above the 37th degree of north latitude. It likes a hot climate and cannot stand the severe winters of the Northern States. It is now grown as far north as Maryland, as far west as the Pacific Coast, and is nearly as common throughout the South as blue grass is in the North. It is the best pasture grass in the South, although many farmers who grow blue grass do not like to admit it.

Bermuda looks brown and dead during the winter and does not begin to get green till late in the spring. For this reason, it is not an ideal lawn grass, still if well kept it is very beautiful in the summer.

Many farmers do not appreciate the value of Bermuda, from the fact that it is somewhat difficult to get rid of, and they want corn, wheat and cotton and not grass and stock. When young and tender it is preferred by stock to almost any other grass, and is very nutritious. One of the many purposes for which Bermuda may be used is in stopping gullies, for the roots attach themselves firmly to the bottom of the gullies, and catch the soil that is brought down by rain. The grass thus helps to fill up such places, for as the bottom fills with soil the grass rises with it and builds up till the general surface of the ground is reached.

Bermuda grass prefers fertile loam soils, such as are common throughout Tennessee. It is liable, however, to be frozen out in some of the most elevated sections of the State. It grows especially well upon the moist, rich soils of the Central basin, and of West Tennessee. It also does well in the East Tennessee Valley.

One of the especial advantages of this grass is its capacity to endure the greatest amount of summer heat and droughts that will threaten the vitality of all other grasses. There is probably no other grass that bears pasturing better, or yields more herbage in the form of pasture than Bermuda grass in sections where it is at its best. To get a stand of Bermuda the seed is seldom sown, for two reasons: (1) The seed is expensive, costing 75 cents to $1.25 per pound. (2) The germination is slow and often poor.

The best and surest means of propagating this grass is to cut pieces of the turf and scatter it along shallow furrows or sow it over the land well prepared by plowing and harrowing and then cover the roots by means of a roller or drag brush.

When Bermuda is once thoroughly rooted it spreads very rapidly and soon takes possession of the field, although in some instances it has been crowded out and overshaded by Kentucky blue grass. Bermuda does not mature seed in Tennessee, and only to a limited extent in any of the Southern States. A well known Southern farmer gives the following method for securing a good stand: "Let the plants be gathered, root and branch, from some patch of ground thickly occupied by them. Let them be shaken free from earth and passed through the cutting-box, as though designed for the manger of an animal. Let these gibbets of an inch long be sown by hand broadcast before the harrow along with oats in the spring of the year. Every joint will be as sure to germinate as the seed corn. But the little plants will be too tiny the first year to interfere at all with the cereal crop. The next year the old stubble will have become the Bermuda sod, yielding an almost incredible amount of pasturage and incapable of being grazed out by the severest treatment in the hottest summer drought."

For the making of hay Bermuda is held in high esteem in all those sections of the South where it grows to a sufficient height for mowing, but the grass must be cut early and often in order to make good hay. It is almost valueless for feeding purposes if left till the culms harden. Just as soon as it grows high enough it should be cut and cured much after the manner of timothy hay. For feeding purposes Bermuda is usually considered the equal of timothy and by many it is considered superior, besides the timothy costs nearly twice as much as the Bermuda. In Mississippi Bermuda has been cured for hay and held in high esteem for more than forty years. To make good pasture it must be kept well trodden and grazed to keep it tender and to suppress other grasses and objectionable weeds. In order to make the best and largest yields of hay it should be mowed two or three times every summer. When properly managed this grass will grow from ten to fifteen inches high. The quality of the herbage is probably not quite equal to that of blue grass. The best pastures, however, support two head of cattle per acre from April till late in October.

For best results Bermuda should be grazed systematically, that is, the pasture be subdivided, and the stock turned into one enclosure and allowed to graze it closely, and then removed to the next enclosure. They should then be returned to the first lot before the grass becomes tough and wiry. If the stock is turned into a single large field a good deal of the grass becomes so wiry by midsummer that they will not eat it readily.

Farmers often fear Bermuda, lest it be hard to destroy, but this can be done if they go about it in the right way. The first thing to be considered is the fact that it does not produce seed. Next, it does not produce a great abundance of deep underground stems, as does Johnson grass. It spreads by long, creeping stems, which grow either on or near the surface of the ground. It can be, in large part, killed at one operation by plowing about one and one-half to two inches deep with a good, sharp

turning plow during dry, hot weather in summer, or just before a cold snap in winter. In the first case the stems are killed by drying, in the other by freezing.

Bermuda does not stand shading well and it is possible to smother it out by rank-growing crops. Professor Dodson, of Louisiana Experiment Station, gives the following method:—

"By breaking the sod shallow in December, and following with a crop that produces dense shade, such as cowpeas or velvet beans, Bermuda grass can be exterminated in a single season." A farmer who is running a stock farm could very easily sow oats in the fall, harvest them for hay in the spring, and then seed thickly to cowpeas or velvet beans. South of Tennessee and Arkansas there is plenty of time for two crops of cowpeas in summer. If this system could be continued for two seasons on land that is properly manured then the grass would be eradicated completely, not to mention the getting of two or three good crops of hay a year. One season of such treatment is usually sufficient. Other good summer crops to use in getting rid of Bermuda are sorghum and millet. The sorghum should be sown thick, about two bushels of seed to the acre: the Bermuda being of low growth, is completely shaded by these taller and denser growing crops. On good land oats yield two to two and a half tons, while sorghum may yield six to ten tons of good hay per acre. In this way the killing out of Bermuda grass ought to be a profitable business on Southern farms, where hay is needed. Some of the best farmers in the South make constant use of Bermuda for pasture on the rougher portions of the farm, and are never bothered with it in the cultivated fields. As it produces no seed in Tennessee there is no danger that stock will scatter it in the manure. Where it does produce seed there is little difficulty in controlling it, and there is no question that it is the best and most available pasture grass in the cotton region.

Bermuda grass has long been recognized as one of the very best grazing grasses for cattle in the United States. Dr. C. W. Dabney says: "The Bermuda grass sod, not only in the cotton States, but in Virginia, has proved itself the most fruitful of all pasturage. There are well-known fields on moderately poor soil, which are today fattening more than one head of cattle per acre. This will equal the blue grass in Kentucky. Some wheat farmers in Virginia have almost surrendered tillage for the sake of cattle raising upon these Bermuda grass fields, because they have found live stock more profitable than wheat, and their present pursuit free from many vexations. In the wheat lands, after the wheat crop is taken off in June, then sow the field in peas. In September the peas are turned under as a fallow crop and the field resown in wheat. After two or three summers of this double cropping the Bermuda is exterminated by the shade of the pea vines." If cattle can be so easily kept on Bermuda grass it seems that sheep could be also. Since cheap cotton is raised in the South why cannot cheap wool be raised also? One acre of Bermuda grass, well established on soils entirely adapted to its growth,

will carry ten sheep for eight months in the year, and in many parts of the South, ten months. Texas blue grass, and in many places Kentucky blue grass, when properly cared for, will carry the flocks through the remaining months. When one considers the great profits that may be derived from the sale of early lambs in the Northern markets, and the growing demand for first-class American wool and mutton, it is not too much to expect that within the next few years sheep and wool, mutton and early lambs will be as well known products of Southern agriculture as cotton is at the present time.

A. W. Shofner, '09.

FORAGE CROPS FOR HOGS.

Hogs are raised profitably without corn, except to finish them for market, in many parts of the Union, Europe and Canada. Although corn has an important place in hog-feeding, it has been shown by many careful experiments that soy beans, cowpeas, peanuts, and other feeds rich in protein, together with skim milk when available, are the best feeds for growth and that an exclusive corn diet is the poorest. In other words, the hog must be fed a balanced ration of nitrogenous compounds and roughages in the form of pasture in summer and stored crops in winter to maintain a healthy, growing and prolific animal. It has been shown recently that barley, rye, cowpeas, clover and wheat products, with digestive tankage will put the balance sheet right without any appeal to the corn belt.

Tennessee is the leading dairy State in the South and the demand for high grade products was never greater. There is nothing fits in better than hog raising with almost any scheme of dairy farming.

The importance of skim milk for hogs has been demonstrated of late by the Missouri Experiment Station. In cheapness of gains the feeds used ranked as follows: Corn and skim milk, cheapest; corn and alfalfa, second; corn and red clover, third; corn and blue grass, fourth; corn and rape, fifth; corn and ship stuff, sixth. Digester tankage will give almost as good results as the skim milk, if the milk cannot be furnished. The Virginia and Michigan Stations have obtained good results with tankage when fed in the proportion of from one-eighth to one-tenth of the concentrated diet.

Theoretically, cotton seed meal from the standpoint of digestible nutrients is a valuable substitute for skim milk; but unless fed in a restricted manner, it will have a toxic effect in the hog and which will usually prove fatal.

Let us now enumerate some of the advantages in hog-raising enjoyed by the Tennessee farmer. First, he has a long growing season which is necessary to the production of variety in forage pastures. Second, an ideal climate, the great essential in any kind of economic and profitable

farming. Third, a liberal supply of pure water—a large factor in maintaining healthy hogs, as well as securing the necessary sanitary conditions. Fourth, an unsurpassed home market. And yet, notwithstanding all that might be utilized in the direction of successful hog raising, the truth still remains as evidenced by recent statistics that our meat house is still very largely in the middle west. This follows very closely a reflection on our farmers that they will not take hold of this question in the way they should. They maintain that feeding 50 cents corn even into $6.00 hogs does not pay, and who will not agree with them when it is fed as it still largely is into hogs that take two years to make into 200 or 300 pounds of meat. The mistake evidently lies in the type of hog and his maintenance. The hog needed is one that will make 200 or 300 pounds of meat in less than one year from being farrowed and will do this largely on grazing crops and with the help of only a few bushels of corn to finish to harden the meat just before killing.

While interest in pure bred live stock is awakening, it should not take the average farmers of Tennessee long to realize that the "scrub" type is a losing proposition for them. The wide-awake hog raisers have philosophically considered the lanky, peaked slow-growing mongrel and logically discarded him for the symmetrical, easy-feeding, early-maturing, pure-bred, because the latter gives so much more profitable return for the feed consumed than the farmer does.

The next point to be considered is the production of crops necessary to grow the hogs at the least cost. It should be the object of every hog raiser to induce his animals to eat as much as possible. The greater the variety the larger will be the amount of feed consumed. The cheapest and most profitable feed is that which can be grown with little labor and harvested by the hogs themselves. It will be economy to supplement each grazing crop with grain and other feeds suited to the conditions of the animals.

The farmer must provide himself with a number of lots fenced with pig-proof fence and convenient to his hog barns. These lots should be as near one size as possible, and seeded with different crops in order to furnish continuous grazing for the hogs during the greater part of the year.

Perhaps Bermuda grass will give the most satisfactory results as a permanent grass for lot one. On this lot should be placed the hog houses. Bermuda grass is thus recommended because it will stand severe drought, the hottest weather and make its best growth during the summer months, when blue grass is practically useless. It is liked by hogs and analyses indicate that it is highly nutritious.

The first crop to be placed in the ground should be cowpeas. Three lots may be devoted to this pasture, sowing at intervals of two or three weeks from May 15 in order that they may follow each other in maturity and thus give rich grazing from September to November. It will be necessary to select an early maturing variety, such as Whippoorwill or

New Era, for this purpose. Plant the seed in rows about thirty inches apart and cultivate shallow and level as often as is necessary to hold the weeds in check. The hogs should not be turned on the peas until a large proportion of the peas are ripe. Cowpeas are rich in protein, and therefore make an excellent food for growing animals, though not desirable as the exclusive feed in the final fattening, as the fat meat produced by them is too soft and oily to be of the highest value. The cowpea can scarcely be overestimated as a grazing crop for hogs in Tennessee. The Alabama Station says that "an enormous increase in the acreage of cowpeas would do more than any other immediately practicable reform to cure the ills of Southern farming, to enrich the soil, to raise the acreage yield of all other crops, to build up the live stock industries, and to promote diversified farming."

Sow one lot in soy beans to make grain for late feeding. Or better still, corn and soy beans. The soy beans and corn may be mixed and drilled with the corn planter. Then at the last cultivation cowpeas should be planted between the rows and the whole crop "hogged" off late in the fall. This combination will furnish a splendid balanced ration for the hogs and they can be finished for market on it without additional grain, Since labor is scarce and wages high, this plan will pay better than harvesting, husking, hauling and carrying the crop to the hogs, besides the cost of handling the manure, with a $140 manure spreader, will be saved. As a grain crop to use in connection with corn for rushing the hogs to market, the soy bean is a very valuable crop. The seed contains a high percentage of protein and an extraordinarily high percentage of fat, being in both respects similar to flax seed and cotton seed. The Kansas Station has found that when soy bean meal was mixed with either corn meal or kaffir corn meal, and fed to pigs, the number of pounds of food required to produce a pound of pork was reduced as compared with either corn meal or kaffir corn meal when fed alone. The composition of the whole plant is similar to that of red clover; and, although the soy bean is somewhat less palatable, it is, in the proportion to which it is eaten, similar in feeding value.

Dwarf Essex Rape sown at any time from the last of July to the middle of September will give a large amount of green, rich forage that is relished by the hogs. The Wisconsin Station has given considerable attention to this crop, and has demonstrated that pigs thrive better on rape than on clover, grain being fed in both cases. It is possible to keep brood sows in good condition on Dwarf Essex rape with very little grain. One thousand headed kale may be substituted for rape.

The later cowpea and sorghum lots, if sorghum be planted, may as one lot, be seeded with crimson clover, wheat, oats, fall barley and rye mixed. This will give excellent winter and spring grazing. Sometimes good results are obtained by substituting veteh for crimson clover. But on the whole crimson clover is the more desirable from the standpoint of nutrition as well as certainty of a stand.

Peanuts can be grown successfully in this State and should have a place in a proper rotation of forage crops for hogs. They should be planted at about the same time as corn. The Arkansas Station states that as a hog food nothing has been found which will more cheaply produce gain than the Spanish peanut. One-fourth acre of peanuts produced 313 pounds of pork, while the same area of corn produced 109 pounds. At the Alabama Station 503 pounds gain of pork per acre was made in six weeks upon peanut pastures alone.

Hogs can be prepared for the market at about two-fifths the cost required by feeding high-priced concentrates, when a succession of grazing crops as indicated above is followed. Not only so but the pork will be of better quality and the hogs will be healthier.

It is expected that a rotation of crops on the different lots will be practiced and thus preserve an equilibrium in the plant food supply. In this way the soil can be greatly improved.

In conclusion, it may be said that there is a broad field for the farmers of Tennessee to occupy in producing a superior article of bacon and other pork products. The climatic and feed conditions are the very best that can be found for producing a grade of pork which can not be excelled in the world.

There is not a day in the year, over large areas of the State, when hogs can not have some form of green succulent food. Pastures of clover, grasses, and annual plants can be provided that furnish a large amount of food which, supplemented with a small ration of grain, will produce a superior article of meat products. The foreign, as well as the domestic, market demands a better pork product, especially in the hams and bacon.

With good blood in the herd as the first essential, and then a proper food supply, the results will be wholly satisfactory.

C. H. Lane.

RESULTS OF EFFORTS TO PROTECT FRUITS AND VEGETABLES FROM FROSTS IN THE VICINITY OF KNOXVILLE, TENN.

While East Tennessee is not a fruit country in the sense that fruit is the principal crop, it has many large apple and peach orchards and many fine vineyards that represent a great deal of capital.

Truck gardening, too, is attracting more and more attention, and more and more money is being invested in the production of small fruits and vegetables for the early market.

One of the greatest obstacles to financial success along these lines is the late frost in spring The grower of vegetables for the early market often sees his profits cut down 50 or 75 per cent or perhaps wiped out altogether by an April frost, while the fruit grower not only sees his profits disappear, but sees a whole year's labor absolutely lost

cause the temperature dropped a few degrees below the freezing point.

What is to be done about it?

Heretofore the grower has spent his time and thought and energy protecting his trees from insect and fungus, or has worked early and late to get his vegetables started in order to be first in the market. He buys the best machinery and studies the newest methods in order to insure success. He prepares in the winter for the marketing of the crop he hopes to produce in the summer. The crop once matured, he takes every precaution for its preservation. The small boy caught in a peach tree is summarily dealt with, the darkey in the melon patch is peppered with shot and invited to move on, the neighbor's cow is run out of the garden if it takes all night. He does all these things with commendable energy and zeal, but at this point he becomes exhausted and is unable to make any further plans, do another night's work, or spend another cent to save the crop he has worked for from total destruction.

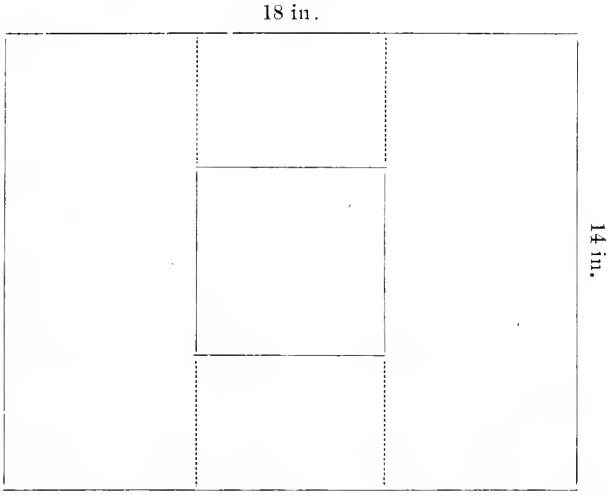
One day in April it turns suddenly cold and he knows there will be a freeze. He goes calmly to bed and gets up the next morning to find the thermometer registering 28 degrees and his labor lost.

It is a well known fact that has been demonstrated time and again that the temperature over any given area can be raised six or even ten degrees by means of small fires properly placed. A little inquiring would have revealed this fact to our grower. A little money would have supplied the necessary materials for the fires. A little labor and forethought during the winter would have made all preparation, one night of watching and starting the fires at the proper time would have saved his crop. A small outlay of time and money for frost protection is every whit as justifiable as any other kind of insurance. Many growers in this section have been thinking of this matter in a general way and a very few made preparation last winter for frost this spring. A few others did a little in the way of protection without any previous preparation.

Mr. Wm. Jenkins, at Wildwood and Valley View fruit farms; Prof. Keffer, at the University of Tennessee fruit farm, and the writer prepared wire baskets for burning coal. J. T. Riggs, who runs a truck farm south of the river; Mr. J. T. Allen, on Black Oak Ridge, and Mr. J. S. Sparks, in West Knoxville, used other material. The results were as follows:

Mr. Jenkins, who operated on a more extensive scale than any of the others, made about 700 wire baskets or enough to protect 25 to 35 acres of orchard. The baskets were made of wire netting, having a

one inch mesh, and the material for 700 cost $14.00. It was bought in strips 18 inches wide and cut in 14 inch lengths. These pieces were cut as shown by the dotted lines in the diagram and were then molded over a block of wood 6 inches high and 6 inches square at the bottom and 7 inches square at the top. It was fastened in shape by twisting in a few of the loose ends of wire.



The basket thus made held about a gallon of coal and burned from three to four hours.

Dry hardwood kindling was placed in the bottom of each basket and the basket then filled with coal and covered with a small square of tarred roofing paper to keep out snow and rain.

The baskets were placed in the orchard about 45 feet apart each way or one basket for nine peach trees. The coal necessary to fill the 700 baskets once cost $5.00, thus making the total cost of material about $20.00 The cost of labor for making, filling and placing the baskets was not calculated as it was done by the regular hands in bad weather during the winter.

On the night the frost was expected careful watch was kept of the temperature and when it approached freezing point the baskets were lighted. The paper cover was removed, a little coal-oil was poured on the kindling and a match applied. After all the baskets were started once they were gone over again and those that had failed to start well the first time were started a second time. These fires made a thick smoke and gave off enough heat to prevent the formation of frost in their vicinity, though heavy frost was seen in other parts of the orchard.

Mr. Jenkins believes that he can save fruit from frost when a rise of temperature of not more than five degrees is needed.

Professor Keffer, at the University of Tennessee fruit farm, also used wire baskets. There was no damage done in his orchard where there were no fires, but the temperature was kept six degrees higher in that part of the orchard, where the fires were located, than it was in adjacent parts.

The writer used about 20 coal fires, part in baskets and part built on the ground in a small apple orchard of about an acre at Smithwood. The temperature was raised from 24 degrees outside of the orchard to 28 degrees under the trees, while in the crowns of the trees, where the smoke was thickest, the temperature was 33 degrees. This orchard is located near the bottom of a valley at the foot of a high ridge and would have undoubtedly been injured without the fires. The wire baskets proved much more satisfactory to handle than the coal fires on the ground.

Of those using other material, Mr. J. T. Riggs, south of the river, used damp straw for his fires and prevented the formation of frost in his garden when there was a temperature of 31 degrees and a heavy frost outside of his fired area.

Mr. J. S. Sparks, who has a garden of several acres on very low ground used two methods for protecting his crop, which was principally beans. A part of the patch was covered thickly with straw and received no damage except to occasional stalks which were not entirely covered and which were all killed. The rest of his beans and his other early crops were protected by fires of railroad ties, placed 75 or 80 feet apart, and suffered no damage whatever.

Dr. J. T. Allen, of Highland Vineyards, used still a different method, and writes: "My vineyard has a high southern exposure on the top of Black Oak ridge, northeast of Fountain City. On the night of April 3rd, Weather Bureau reports and local conditions indicated severe frost likely to occur. I set three men to cutting dry wood and placing it in small piles 50 to 75 feet apart, over twelve acres of vineyard. As the night was almost calm the direction of the air current was determined by lighted torches and the piles were so placed that the smoke would drift over the largest area possible. Careful watch was kept and at the first appearance of frost, which occurred at about half past two, the fires were quickly lighted. When they were burning well from a half bushel to a bushel of damp horse manure was dumped on each fire. The damp manure caused the fires to burn slowly and created a dense smoke which enveloped orchards, vineyards, cleared land and forests as it slowly settled into the valley a mile below where it hung a great cloud long after sunrise. Frost was plentiful on bridges, leaves and grass north of our fires, but not a leaf was injured where our smudge reached, even in low places. It was an ideal night for the use of a smudge. Former trials

have failed because of shifting air currents, but in this instance it was most effectual."

Each man who made an attempt to protect his crop is convinced that he was benefited or that he would have received benefit if he had needed it.

Mr. Allen's former difficulty with smudges on nights with changing winds could probably be overcome by using portable smudges that could be moved to any part of his vineyard at will.

Soon it will be time to prepare for early frosts in the fall. The gardener who has late corn beans, okra, or other tender vegetables, can, by using one of these methods, protect them from the first frosts and thus save them for a few days and possibly a few weeks of further fruitfulness and profit. J. F. VOORHEES, Local Forecaster.

LIGHTNING RODS.

FROM THE ILLINOIS AGRICULTURIST.

In this article it is the intention of the writer merely to give a brief statement of the causes of lightning discharges and to describe briefly a few of the most approved methods used in the protection of buildings from these discharges.

The appearance of a charge of electricity upon a cloud is caused by the evaporation of moisture, and as a result usually appears on a day when the evaporation has been very rapid. A cloud thus charged, in passing over the land tends to draw a charge of opposite kind to the surface. When the difference of pressure becomes sufficiently great an electric discharge takes place. So long as this discharge takes place through a conductor of sufficient size and of very low electrical resistance, it flows quietly and will do no damage, but when it is compelled to jump an air gap or a poor joint in the conductor it assumes a disruptive nature.

A lightning rod is a pointed conductor, connected with the earth and extending above a building with the object of protecting it from the disruptive action of lightning. It fulfills two functions:

First. A lightning rod tends to prevent a disruptive discharge from occurring by silently dissipating the charge that has gathered on the building and immediate neighborhood. This phenomenon depends on what is called the power of points. If a rod has a sufficient number of points to dissipate the induced charge on a building as fast as it is formed then there is no danger of that building being struck by lightning.

Second. A lightning rod protects a building by offering a path of low resistance by which the discharge, in case there is one, may be carried off harmlessly to the earth. A lightning discharge always follows the path or paths of least resistance. If there are several paths of comparatively low resistance the discharge will sideflash, as we say, and divide itself

among the several paths in direct proportion to their conducting capacities. For this reason rainwater spouts and all other outside metal should be connected to the earth. It is usually considered best to connect large surfaces, such as tin roofs to the earth by separate conductors rather than connecting them direct to the lightning rods. Metal roofs if properly connected to the earth by suitable conductors offer considerable protection to the building.

A conductor may be in perfect condition above ground and yet be of no very great good unless it is well grounded in solid moist earth some feet from the surface. If the rod is simply driven into the earth it will not present enough surface to the earth to make what is called a good ground. The rod should be fastened to a metal plate and the latter buried in the ground with about six inches of small coke packed around it. If the earth is very moist and solid this plate need not be over two feet square, but if the ground is rather dry and loose the plate must be larger.

After considering the ground the next thing of importance, is the other end of the rod, the spike. If you want perfect protection you must leave nothing projecting upward unspiked. The points should be good. The best points are cones of copper, not too sharp, and thickly gilt. A number of points on a rod are much better than only one.

The rod itself should have considerable surface, but a rather small cross-section area.

The best lightning protection is that offered by a wire netting all over the house, a good earth connection to it at several points, and all over the roof a plentiful supply of that barbed wire which serves so admirably for fences. With this kind of a system all of the tin roofs, drain pipes, etc., should be connected to the net.

If the former system is used a strip of flat sheet iron about two inches wide will make a very good conductor. Sharp corners should be avoided, and it is best to run the conductor down from the gable rather than running it down over the eaves troughs. It is not necessary to insulate this conductor from the building.

Do not make your ground connections near water or gas pipes unless necessary, but if you do, connect the conductors to the pipes.

If a rod is run up a chimney or brick wall, it may be well to insulate it to protect the bricks from concussion.

A very cheap way of protecting an ordinary house is to run common galvanized iron telegraph wire up all the corners, along all of the ridges and eaves, and over all of the chimneys; taking them down to earth in several places, and at each place burying a load of coke. Rain water spouts and all other outside metal, if well connected together, may likewise be utilized. It is a good plan to connect large tin roofs independently to the ground rather than connecting them to the rods. It is not wise to erect very tall rods above the roof of a building. It is best to have a large number of rather short rods.

Rods with the exception of the points, should be made of one metal

throughout, and with as few joints as possible. Only one rod on a building and of too small a size or with a poor ground connection, may in some cases be a source of danger, rather than a protection. This is due to the fact that a cloud never discharges all at once, but there is usually a number of discharges in quick succession in the same place. The rod may draw the first discharge and be burned out, leaving the building unprotected for the others. In general lightning rods are a great protection to a building, and almost any conductor is better than none.

W. C. MADDOX.

AGRICULTURAL EDUCATION.

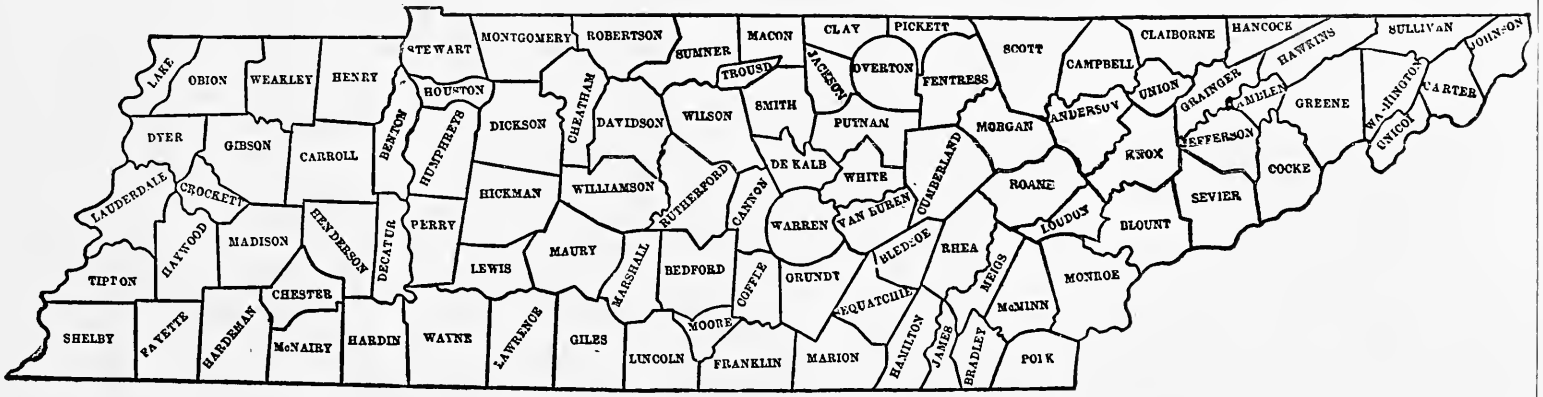
Summer Session of the University of Tennessee.

Last summer, the University of Tennessee organized a six weeks' course in agricultural subjects for the special benefit of teachers of the public schools. Courses in agronomy, animal husbandry, horticulture, dairying, poultry, bee-keeping, forestry, plant life, and animal life were given by members of the regular agricultural faculty of the University. In order to encourage Tennessee teachers to avail themselves of the opportunities for this work agricultural scholarships exempting holders from payment of tuition fee were granted by the University to two students (teachers) from each county, subject to election by the county superintendent of schools. Sixty-nine teachers representing 43 of the 96 counties availed themselves of the opportunity given by these free scholarships and formed enthusiastic classes. These teachers and the counties represented were published in tabulated form in the November, 1907, issue of this magazine, which was made the official organ for their "Association of Teachers of Agriculture." Besides these sixty-nine teachers the classes included other members who were attending the Summer School of the South, which held its annual session on the University grounds at the same time.

The success and popularity of these agricultural courses led the authorities to plan similar work for this summer, with an additional course in agricultural education. The reciprocal courtesies between this Summer Session of the University and the Summer School of the South, by which members of the one are admitted to classes of the other, are again provided, enhancing the efficiency of both—the two together making what is doubtless the most comprehensive summer courses for teachers offered anywhere in this country.

As was anticipated, the fame of last year's work, widened mainly by the members of the class, has greatly increased the number of scholarship students, a list of whom follows:

MAP OF TENNESSEE



List of Tennessee Teachers Having Agricultural Scholarships

ANDERSON
Grace Trevathan, Clinton.
Nannie Holt, Clinton.
Nettie Dobbins, Clinton.
R. L. M Wallace, Clinton, R.D.1

BLOUNT
Wm. A. Brickey, Maryville
John M. Roddy, Maryville
Chas. O. McCall, Greenback
Fred M. McMurray, Chilhowee

FAYETTE
Effie Crawford, Oakland

GIBSON
Pollie Elmore, Nut Bush

GILES
Sallie Ridgway, Prospect Station
Anna Kennedy, Culleoka

GRAINGER
Dorsie Bryan, Rutledge
Jennie Acuff, Rutledge

GREENE
Sue Russel, Greeneville
Elizabeth Susong, Greeneville
Mary Trim, Greeneville
Ada Hawley, Greeneville

GRUNDY
W. H. Nelson, Monteagle

LOUDON
James B. Soward, Lenoir City

McMINN
Pryor Logan Stiles, Niota

MADISON
Wm. A. Malone, Bemis
Joe A. Cowan, Bemis
Willie M. Bryan, Denmark
John S. Holmes, Lavinia
B. L. Tyson, Jackson

MAURY
Fannie B. Alford, Culleoka
David T. Harris, Culleoka
Mrs. Jesse Tomlinson, Columbia

MONROE
E. G. Hall, Knoxville

BRADLEY
Sallie Bates, Cleveland
Arthur Pirkle, Cleveland
Leona Slaughter, Blue Spring
Baxter Gass, McDonald, R. D. 1

CAMPBELL
Katherine Griffith, Wooldridge
Cora E. Jones, Jellico
Jesse Woodward, Jellico

CARROLL
Wm. J. Forbess, Huntingdon, R.D.4
Minnie Thomas, McKenzie
J. W. Williams, McLemoresville

CARTER
Bennick Hyder, Elizabethton
Monta E. Hyder, Elizabethton

CLAIBORNE
Jennie Burkes, Cumberland Gap
Bernard B. Horton, Cumberland Gap

COCKE
John Campbell, Bybee
Samuel Padgett, Bybee
Mrs. W. R. McElroy, Newport
Mrs. Ruth Webb Odell, Newport

COFFEE
John Q. Davidson, Summitville
Wm. Hamilton, Summitville

DAVIDSON
Samuel T. Johnson, Watertown

DE KALB
Homer A. Potter, Smithville
Willie M. Potter, Smithville
Thos. L. Robinson, Alexandria

DYER
C. M. Walker, Dyersburg
Annie M. Harton, Dyersburg

HAMBLEN
Bessie Lee Wood, Morristown

HAMILTON
Jas. Edw. Walker, Ridgedale
Wm. Jacob Ziegler, Hill City
John B. Brown, Chattanooga

HARDIN
Joe A. Gowan, Jackson
Wm. E. Rogers, Savannah

HAWKINS
Mary Lee Maxwell, Mooresburg
Coraetta Gillenwater, Rogersville

HENDERSON
Cora Richardson, Cedar Grove
Fleetie Richardson, Cedar Grove
G. M. Steele, Sardis
Hattie M. Wright, Adamsville

JAMES
Letha Smith, Georgetown

JEFFERSON
Gertrude Hill, Dandridge
Nell R. Franklin, Jefferson City

JOHNSON
Wm. E. Goldring, Mountain City
Olive P. Hawkins, Laurel Bloomery
Mary S. Jenkins, Mountain City
Ethel Anna Wagner, Mountain City

KNOX
W. A. Montgomery, Concord, R. D. 2
Mark R. Sellers, Fountain City

LAWRENCE
Easter Maught, Lawrenceburg
Prudence Maught, Lawrenceburg

LINCOLN
Memory Davidson, Petersburg
George Warden, Fayetteville

MONTGOMERY
Mattie Basford, Woodford
Jessie Basford, Woodford
Fannie M. Smith, New Providence

OBION
Robert Latimer, Union City
Fletcher Woods Akin, Union City
Burch Atkins, Gleason

POLK
Arthur Collins, Isabella
Mrs. Dona Lunsford, Benton

ROANE
Bennie E. Rothe, Kingston
Dorsie Monger, Rockwood

SEVIER
Hattie Cowan, Trundles Cross Roads
Albert Temple, Sevierville
Milus D. Webb, Sevierville
Myrtle Webb, Jones Cove

SHELBY
Bessie Etheridge, Bartlett

SULLIVAN
Edgar C. Lacy, Indian Spring
Mrs. E. C. Lacy, Indian Spring

UNION
W. O. Ballard,
J. L. Henegar, Lost Creek
James Kellar, Maynardsville
H. A. Loy, Maynardsville

WASHINGTON
Hannah Anderson, Washington College
A. V. Markwood, Washington College

WEAKLEY
Lula Montgomery, Gleason

Agricultural Education—Prof. Main.

This course is planned for all prospective teachers of agriculture of whatever class rank. It develops the pedagogics of agriculture, plans, courses of study, anticipates the problems of the teacher of agriculture in the public schools and offers a review of the underlying principles of the science.

7, 8, 9. Equipment of a high school for laboratory and field work. Experimental and demonstrative work in soil physics, general and organic chemistry, milk testing, fertility and feeding. Plot work for schools. Lessons from the Station Farm. Courses of study for rural and high schools. Use of agricultural literature. One hour lecture, two periods, laboratory or field work throughout the year.—University Catalogue.

That man has a liberal education who has been so trained in his youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic-engine, with all its parts of equal strength and in smooth working order; ready, like a steam engine, to be turned to any kind of work and spin the gossamers, as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of Nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of Nature or of Art, to hate all vileness, and to respect others as himself.

Such a one and no other, I conceive has a liberal education; for he is, as completely as a man can be, in harmony with Nature. He will make the best of her and she of him. They will get on together rarely; she as his beneficent mother; he as her mouthpiece, her conscious self, her minister and interpreter!—THOMAS H. HUXLEY.

EDITORIAL.

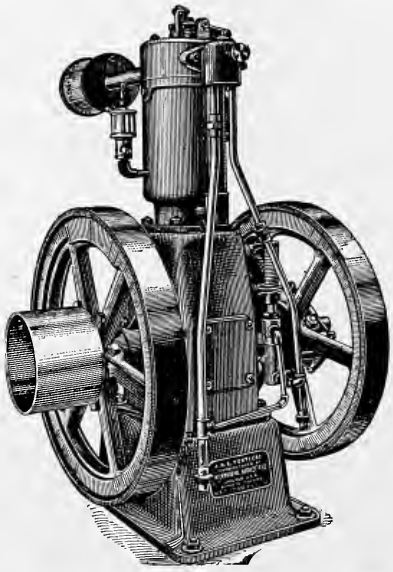
It is up to the printer to explain why our May frontispiece, which is from the Missouri address of Dean Davenport, of the Illinois Agricultural College, was attributed to Eugene Howard. Neither of the gentlemen have sued us yet but we warn prospective editors of the danger of committing editorial responsibilities to the tender mercies of a printer who sets copy, not as it is, but as he thinks it should be.

The carrying out of the combined programs of dedication of the new agricultural building, the East Tennessee Farmers' Convention, and the East Tennessee Teachers' Association, as partially announced in our April issue, focused attention on "the Hill" on May 27, 28 and 29. On Thursday morning the dedicatory address by Dr. Eugene Davenport was delivered to the combined assemblage of teachers, farmers and visitors. On the other days a three ring circus was kept going representing the teachers, the farmers, and the housewives. A full report of the dedication will appear as a press bulletin of the University.

Count The Jobs You Have

. . . FOR A . . .

Reliable Power.



You know them better than we—a score of places where farmers are using power these days and making money by it.

The I. H. C. gasoline engines which can be had in varied styles and numerous sizes are ideal for farm purposes.

They are simple, easily understood and easily operated. They don't go on a strike and give you the trouble some gasoline engines do.

Then you will get all the power at which your engine is rated.

And you get this abundant power at a low cost. I. H. C. engines use gas, gasoline or alcohol, and are most economical in the use of fuel.

Here is one of the great points to consider in I. H. C. Engines. They are made to be run by people who are not expert mechanics. That means safety and simplicity and the least possible chance of their getting out of order.

You cannot afford to buy an engine you do not know to be dependable.

These engines are furnished in the following styles and sizes:

Vertical—2 and 3-H. P. Horizontal stationary—4, 6, 8, 10, 12, 15 and 20-H. P.
Horizontal portable—4, 6, 8, 10, 12, 15 and 20-H. P.

Just look over your needs for a good reliable power and then call on the international local agent or write for catalog.

FARM SCIENCE The best book of the kind ever published, touching every phase of farm practice, mailed for three 2-cent stamps. Send for it before the edition is exhausted.

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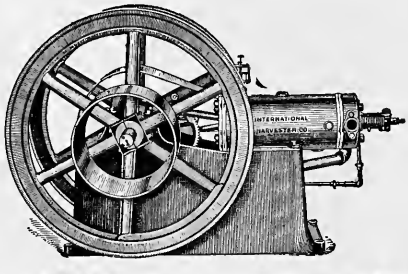

I. H. C.
Gasoline Engines.

U. T. FARMER

VIEW OF GRAND STAND, TENNESSEE STATE FAIR, 1907

Vol. II No. 2

NOVEMBER, 1907

Published Monthly by

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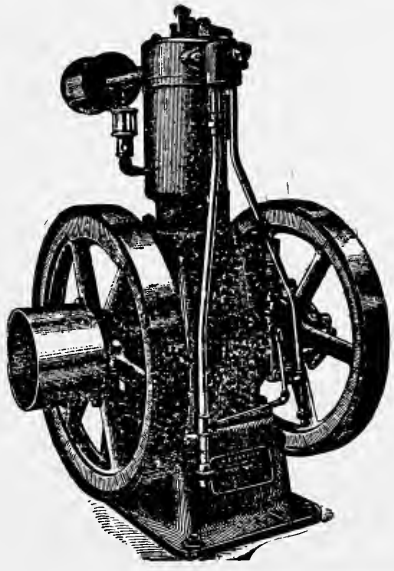
Count The Jobs You Have

... FOR A ...

Reliable Power.



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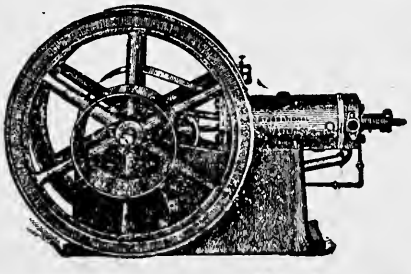

I. H. C.

Gasoline Engines.

Please mention the U. T. Farmer when you write to Advertisers.

U. T. FARMER

BACK TO THE FARM

Vol. II

No. 3

DECEMBER, 1907

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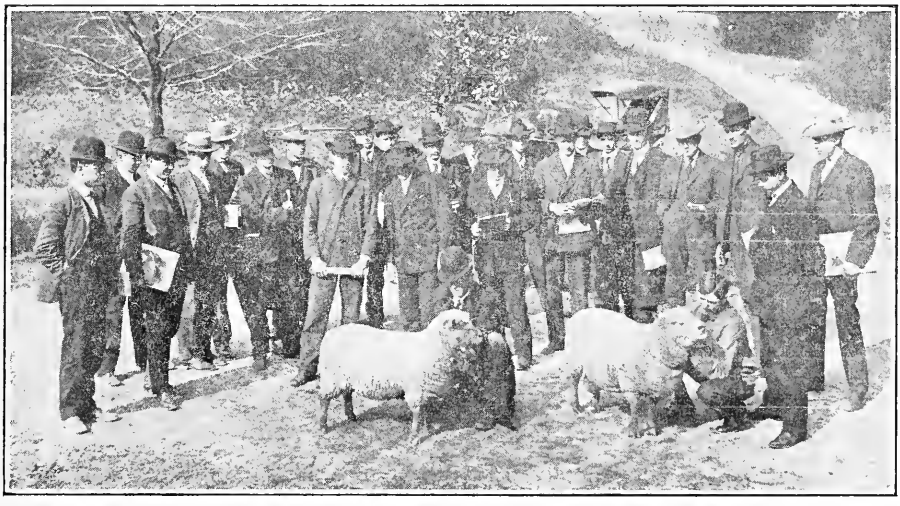
U. T. FARMER

THE WAY TO BE SUCCESSFUL WITH SHEEP



IS TO STUDY THEM.

Vol. II No. 4

JANUARY, 1908

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U. T. FARMER

NEW HOME OF THE DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
Courtesy of Division of Publications U. S. Department of Agriculture.

Vol. II No. 5

FEBRUARY, 1908

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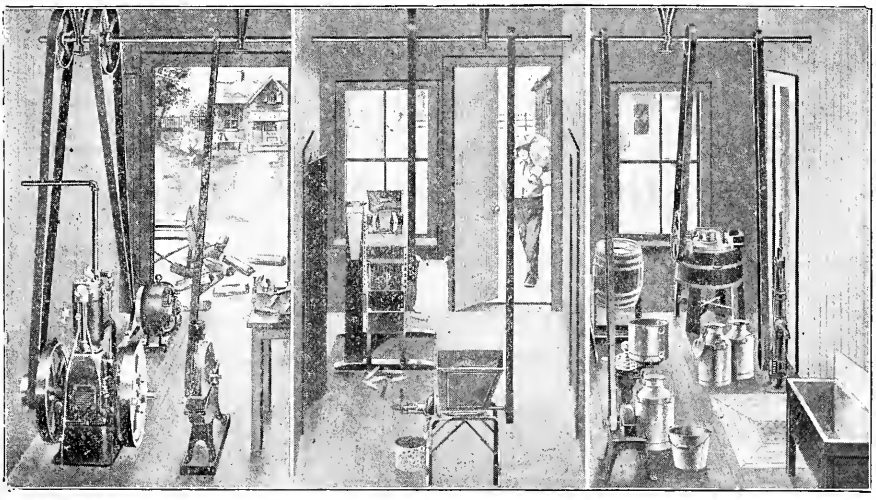
FARM POWER HOUSE



Every farm needs a farm power house—something like the one illustrated above. You see the engine is installed in a shed or barn and the various machines—grind stone, drill press, sheller, feed grinder, bone cutter, separator, churn, washing machine, pump, etc—are operated by belt connected to line shafting driven by the engine. This makes an unusually convenient arrangement. The power is always ready, day or night, for operating any of the machines.

The best engine to install in such a power house is one of the famous

I. H. C. GASOLINE ENGINES

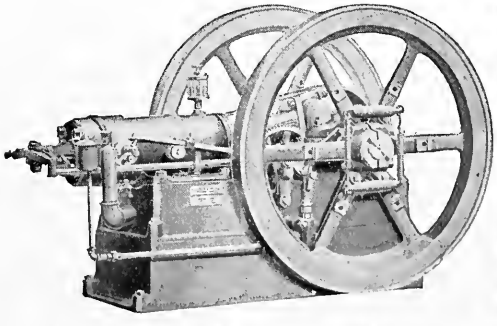
These engines are everything that a good farm power should be—simple, adaptable, convenient and economical. They are always ready to furnish power when you are ready—just open the fuel valve, close the switch, give the fly wheel a turn or two, and away it will go, doing the work without delay, trouble or great expense.

I. H. C. engines, of course, can be purchased in a number of styles and sizes. One of the portable or semi-portable styles will be found just as convenient and just as economical as the stationary for use where it is necessary to have the power at different points on the farm.

Call on the nearest local agent and discuss this power house question with him. He will be able to demonstrate why you need a gasoline engine, and also why you should buy an I. H. C. Ask him for one of the beautifully illustrated I. H. C. gasoline engine catalogues, or if you prefer write home office for particulars, colored hanger and booklet, "300 Years of Power Development."

Built in the following styles and sizes:

Vertical 2 and 3-horse power.
Horizontal (Stationary and Portable), 4, 6, 8, 10, 12, 15 and 20-horse power.
Traction 10, 12, 15 and 20-horse power.
Air cooled 1-horse power.
Sawing, spraying, pumping outfits and jacks.



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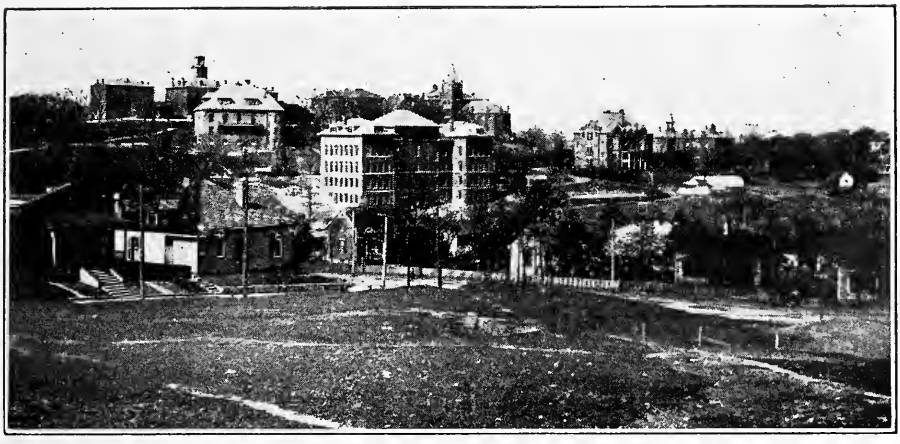

THE HILL FROM CIRCLE PARK SHOWING NEW AGRICULTURAL BUILDING

Vol. II No. 6

MARCH, 1908

Published Monthly by

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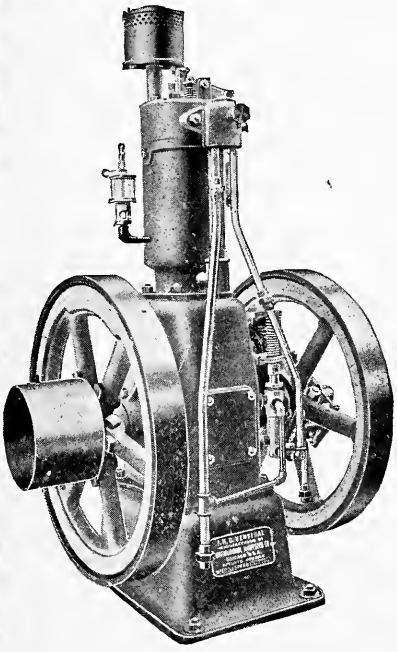

THE MODERN FARM HELPER

It's the I. H. C. gasoline engine—the power producer which has solved the hired help problem for thousands of farmers everywhere.

The I. H. C. engine is essentially a farmer's engine because it is simple, easy to understand, and operate. A farmer has neither the inclination nor the time to master an intricate engine. He wants one that is simple; that will work when he is ready to work without trouble or delay. Besides he wants an engine which will furnish power at a small expense.

In other words, every farmer needs an I. H. C. gasoline engine—the simple, reliable, and economical farm helper.

The I. H. C. line is compete and includes stationary and portable engines of various descriptions. If a farmer wishes to install the engine permanently in a certain location, he can purchase a stationary engine, while if he wishes a power which can be used at different points on the farm, he will find the portable or semi-portable outfit very desirable.

I. H. C. engines are furnished in the following styles and sizes:

Vertical 2 and 3-horse power.

Horizontal (Portable and Stationary) 4, 6, 8, 10, 12, 15 and 20-horse power.

Traction 10, 12, 15 and 20-horse power.

Air cooled 1-horse power.

Sawing, spraying and pumping outfits and jacks.

Call on the nearest local agent and ask him to demonstrate these engines. Ask for a copy of the beautifully illustrated catalogue, or if you prefer write the home office for full particulars, colored hanger and booklet, "300 Years of Power Development."

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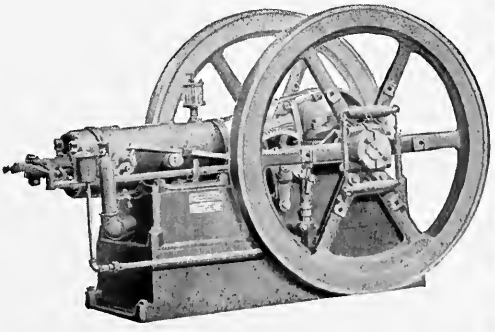

U. T. FARMER

AN ACRE OF SOJA BEANS

UNIVERSITY FARM, OCTOBER 14, 1907.

Vol. II No. 7

APRIL, 1908

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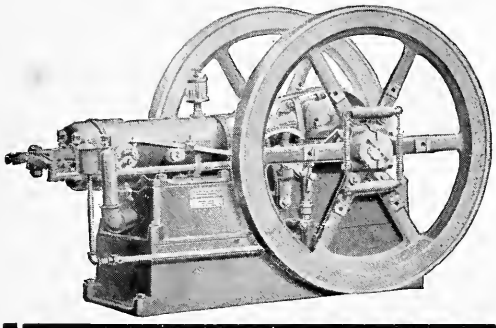
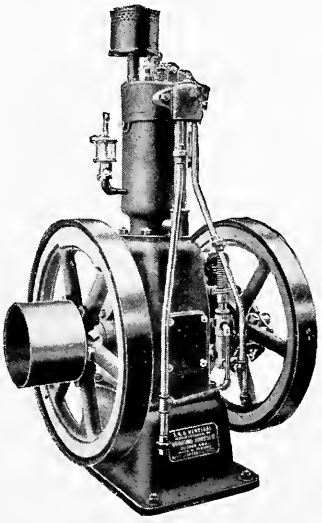


EVER READY POWER

I. H. C.

GASOLINE ENGINES



You will find an I. H. C. gasoline engine an ever ready source of power. Open the fuel valve, close the switch, give the fly wheel a turn or two by hand and you will have ample power for all purposes. On the farm the I. H. C. engine will run the churn, drill press, washing machine, pump, separator, grind stone, sheller, grinder, bone cutter, and various other small machines. This engine will also furnish power for operating the thresher or the husker and shredder.

You will find in the I. H. C. line a size and style which will exactly suit your needs no matter what the work in hand may be. They have been used on the farm, in the shop, and in the mill and have given unqualified satisfaction in all instances.

Built in the following sizes and styles:

Vertical, 2 and 3-horse power.

Horizontal (Portable and Stationary) 4, 6, 8, 10, 12, 15 and 20-horse power.

Traction, 10, 12, 15 and 20-horse power.

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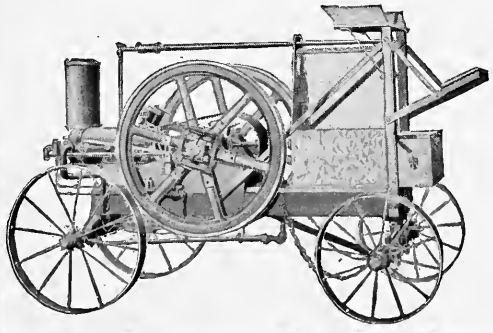

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U. T. FARMER

EAST TENNESSEE FARMERS INSPECTING ALFALFA AT EXPERIMENT STATION

Vol. II No. 8

MAY, 1908

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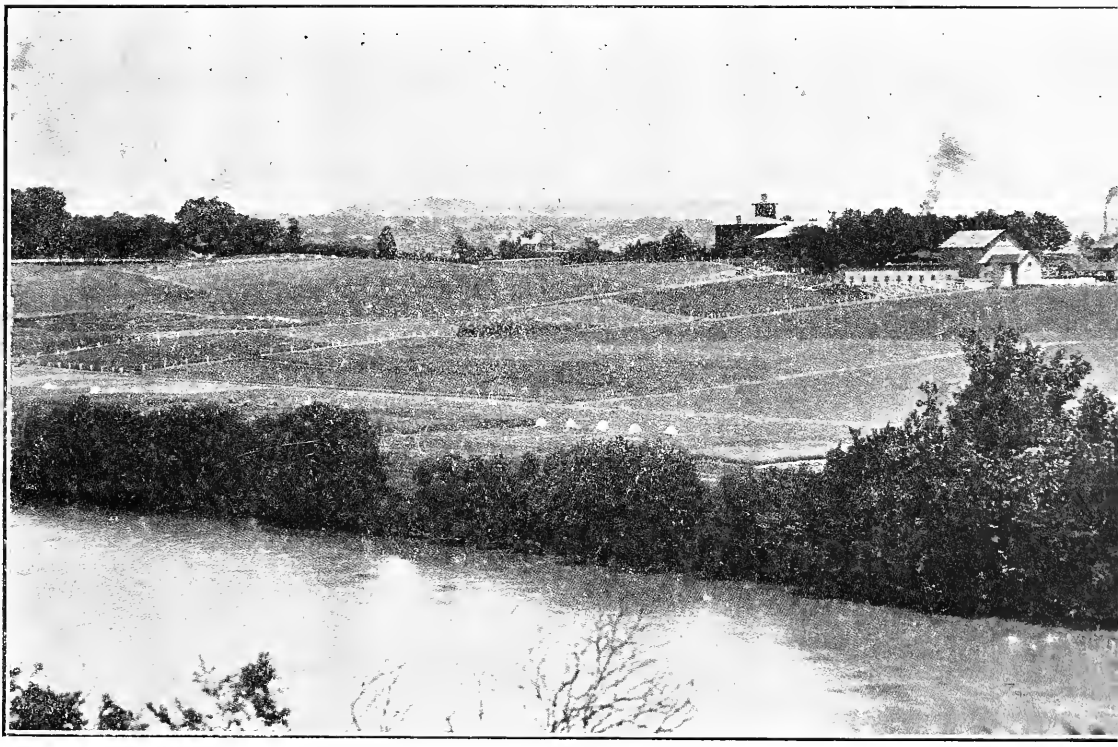

EXPERIMENT STATION FARM FROM ACROSS TENNESSEE RIVER, LOOKING NORTH.

Vol. II No. 9

JUNE, 1908

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